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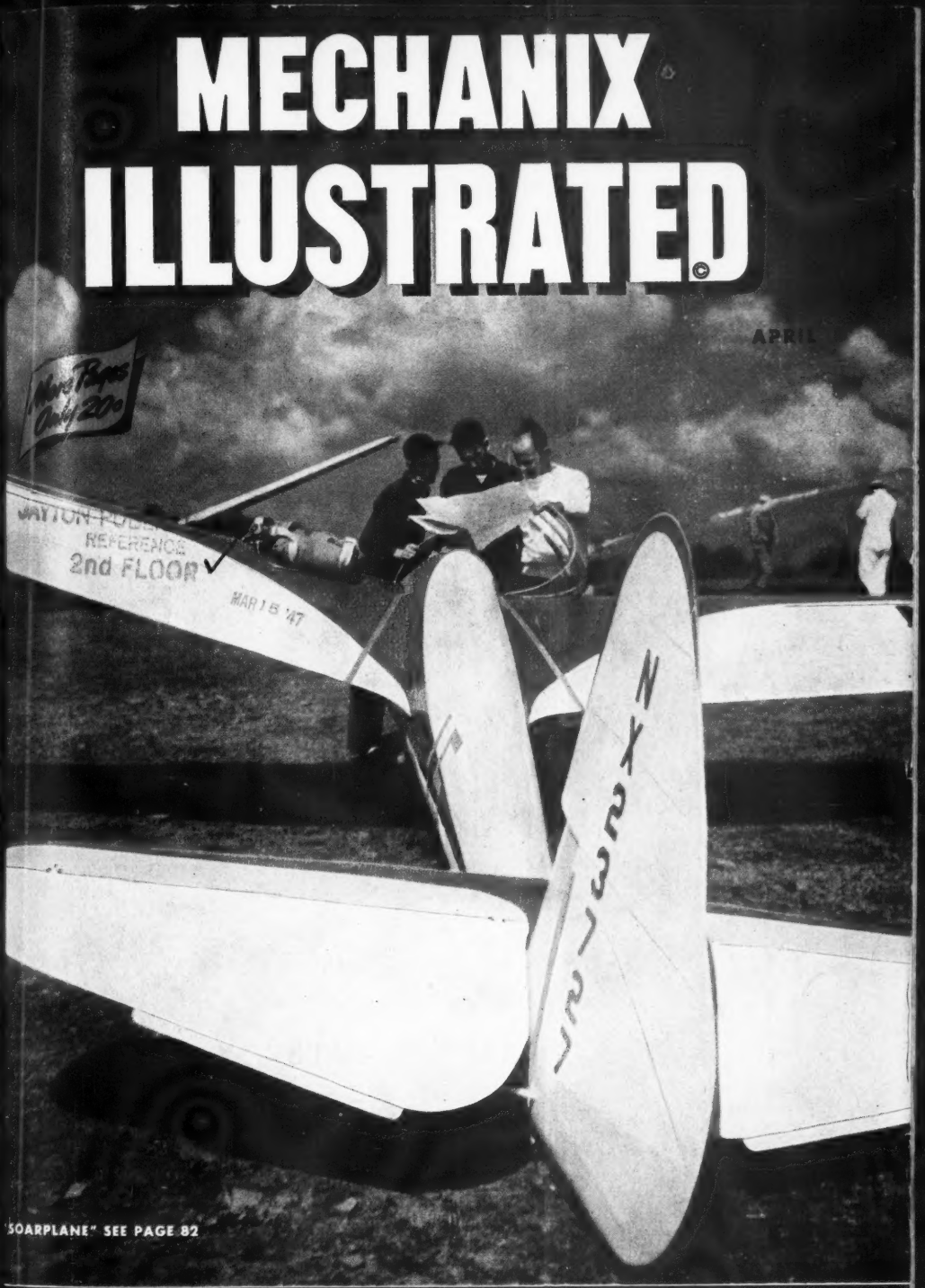

"SOARPLANE" SEE PAGE 82

AIRLINERS NEED NOT CRASH! SEE PAGE 49

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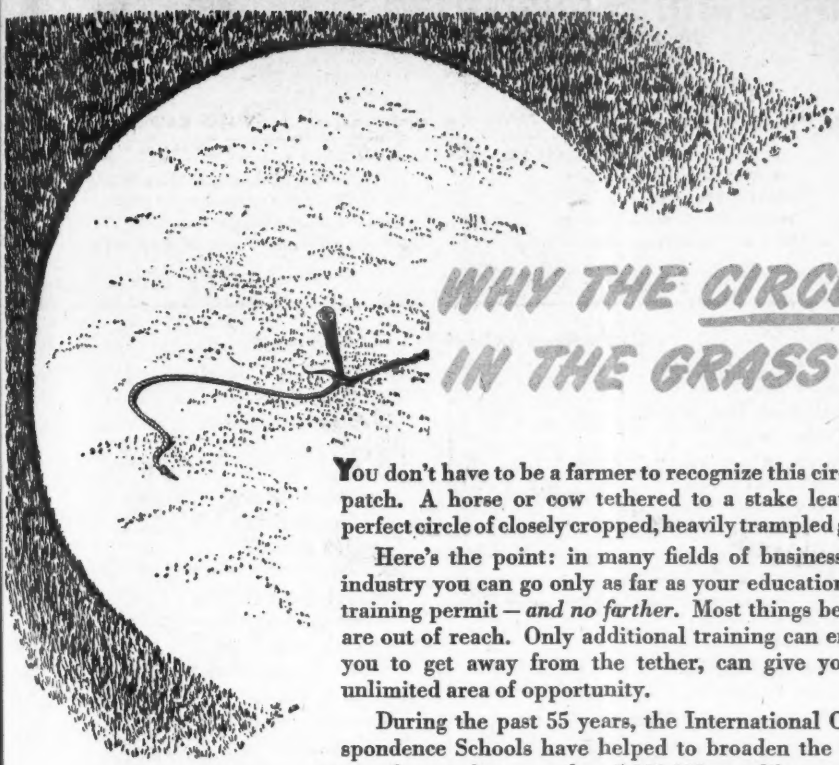

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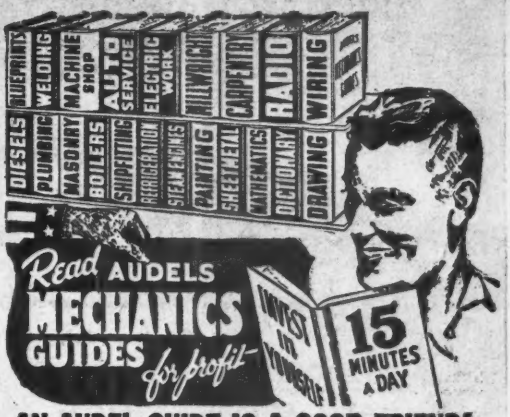

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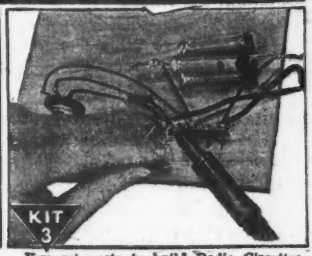

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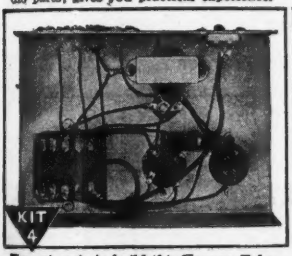

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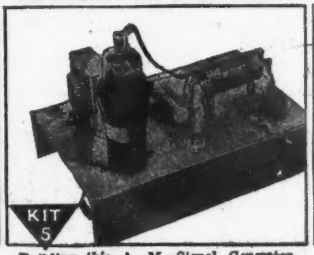

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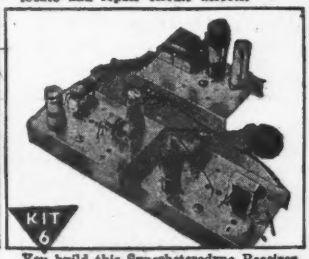

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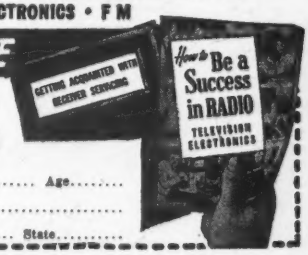

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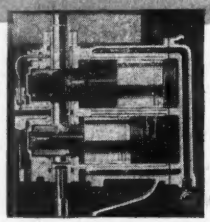

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A patent gives the inventor the exclusive right to prevent others from making, using, or selling the invention claimed in the patent for a period of 17 years.

The patent laws were enacted for the benefit of the inventor to give him protection for the features of his invention which are patentable. These features must be properly and concisely set forth and claimed in a formal application for patent in order to comply with the requirements of the U. S. Patent Office. For that reason, the Patent Office advises the inventor to engage a competent registered patent attorney to prepare his application for patent and represent him before the U. S. Patent Office Examiner.

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I really believe your course the best investment a mechanically minded man can make.—Claude E. Allen, Indianapolis, Ind.

I have received your Course in Appliance Repairing and I must say I am well pleased with same. I am only sorry I did not have said Course some years ago. I have learned so much more through this course I would not part with it.—Charles Schwarz, Hamilton, Ohio.

The Course in Appliance Servicing arrived a few days ago. Want to take out a few minutes of my valuable time to let you know that this is just what I have been looking for ever since I opened up my Fix-It shop. I must admit that you told the truth when you said that it contains quite a bit more information than I bargained for.—P. J. Breil, Sebring, Ohio.

I am a mechanic for the Western Union Telegraph Co. Three days after receiving the lessons in refrigeration I earned the exact cost of the course.—Henry S. Lee, Washington, D. C.

I work day times at the shipyard and after 4:00 P.M. I operate from my cellar and garage. I average $10.00 to $15.00 clear every day.—Walter Hanby, Brockton, Mass.

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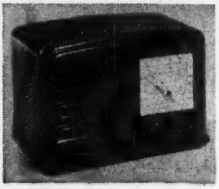

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Short wave and regular broadcast band receiver kit. Many top features that will interest more advanced radio students and enthusiasts. Kit also includes good looking brown or ivory plastic cabinet. Ask for Kit S-6-X. Cost, less tubes $18.95.

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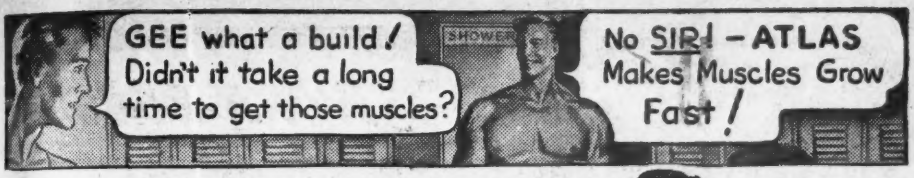
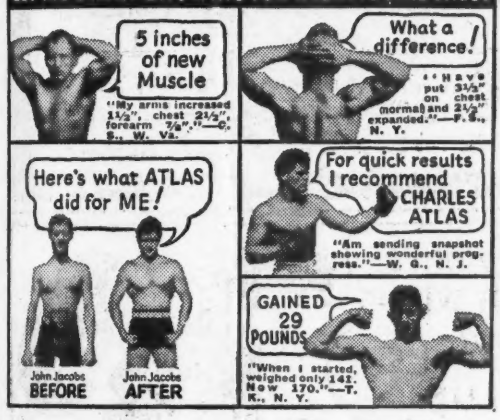


Will You Let Me PROVE I Can Make YOU a *New Man?*

LET ME START SHOWING YOU RESULTS LIKE THESE



CHARLES ATLAS

Awarded the title of "The World's Most Perfectly Developed Man" in international contest—in competition with ALL men who would consent to appear against him.

This is a recent photo of Charles Atlas. It is not a studio picture but an actual untouched snapshot.

Here's What Only 15 Minutes a Day Can Do For You

I DON'T care how old or young you are, or how ashamed of your present physical condition you may be. If you can simply raise your arm and flex it I can add SOLID MUSCLE to your biceps—yes, on each arm—in double-quick time! Only 15 minutes a day—right in your own home—is all the time I ask of you! And there's no cost if I fail.

I can broaden your shoulders, strengthen your back, develop your whole muscular system INSIDE and OUTSIDE! I can add inches to your chest, give you a vise-like grip, make those legs of yours lithe and powerful. I can shoot new strength into your old backbone, exercise those inner organs, help you cram your body so full of pep, vigor and red-blooded vitality that you won't feel there's even "standing room" left for weakness and that lazy feeling! Before I get through with you I'll have your whole frame "measured" to a nice, new beautiful suit of muscle!

What's My Secret?

"Dynamic Tension!" That's the ticket! The identical natural method that I myself developed to change my body from the scrawny, skinny-chested weakling I was at 17 to my present super-man physique! Thousands of other fellows are becoming marvelous physical specimens—my way. I give you no gadgets or contraptions to fool with. When you have learned to develop your Strength through *"Dynamic Tension"* you can laugh at artificial muscle-makers. You simply utilize the DORMANT muscle-power in your own God-given body—watch it increase and multiply double-quick into real solid MUSCLE.

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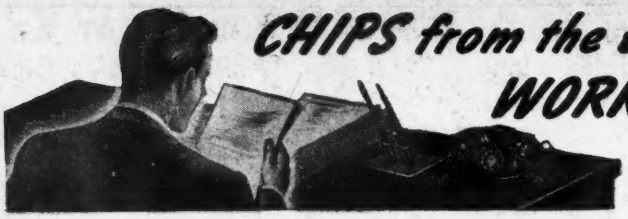


CHIPS from the EDITOR'S WORK BENCH

Attention, Workbench Fans!

Again we would like to remind our readers of the necessity of putting their names and addresses on the backs of all photos sent in for Workbench Awards and Certificates of Merit. We have quite a number of pictures that deserve publication but we are unable to do so because they are unidentified. Workbench Awards, as previously announced, are accompanied by $5.00 or $10.00 checks. Certificates of Merit were awarded last month to the following:

Robert Kawahara, Seattle, Wash.
Peter Pasholk, Schofield, Wis.
Wm. H. Pethick, Regina, Sask, Can.
L. W. Benton, Davenport, Iowa
Wm. S. Sehsaincki, Milton, Pa.
P. Seidenschwarz, West New York, N. J.

LOOK MOM, NO OARS!

That's right, those youngsters are enjoying a spin in an 8 ft. boat powered by an inboard electric motor. Their dad, Lloyd A. Morton of Sedalia, Missouri, built the ingenious craft in 60 hours working time. Congratulations to you Mr. Morton for your fine work. A $10.00 Workbench Award is already on its way to you.

New Bird Films

Basic bird studies, and the mechanics of bird flight, comprise a series of six new discussional-type slidefilms, produced and distributed by the Jam Handy organization in its "New Science Adventure Series."

While these films are primarily designed for use in schools, they also lend themselves to study and visualized discussion among all groups interested in the subject of birds, their habits, habitat, characteristics and protection.

M I'S BOUNCIE

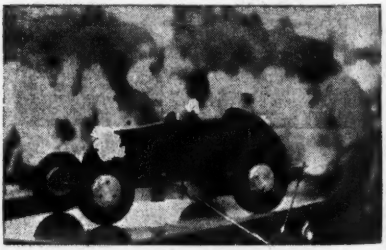
This super-detailed 32 inch speedboat was built from M I plans by Dick Stanford of Winnipeg, Canada. The model is powered by a Hurricane "24" gas motor and can be run free or on a tether. Hands across the border Dick, and a $10 Workbench Award is on its way north for your fine craftsmanship.

Three-Dimensional Photography

The United States Naval Photographic Service is developing a new three-dimensional photography process known as Trivision. It is based on the work of Douglas F. Winnek. Of particular interest to the photographic world is the fact that no special

[*Continued on page* 14]

DOES 90 MILES PER HOUR



This little six-pound race car, powered by a 2-cycle Hornet engine is expected to break its present record with a burst of 100 mph when all the bugs have been taken out. A $5.00 Workbench Award is rolling down to John Carlson of the Harvey Model Race Car Club, Chicago, Ill.

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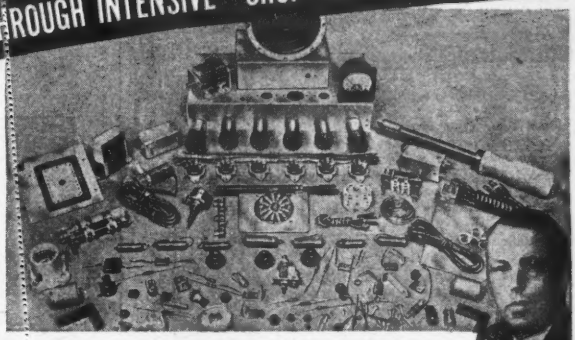

YOU DO EXPERIMENTS, CONSTRUCTION, TROUBLE-SHOOTING

I'll show you how to perform over 175 instructive Experiments—how to build countless Radio Circuits. You'll learn a new, fast way to test Radio Sets without mfg. Equipment.

I give you a fine, moving-coil type Meter Instrument on Jewel Bearings—with parts for a complete Analyzer Circuit Continuity Tester. You learn how to check and correct Receiver defects with professional accuracy and speed.

You'll get valuable experience and practice building this Signal Generator and multi-purpose Tester. Makes a breeze out of fixing Radios and you don't have to spend money on outside, ready-made equipment.

Soldering, wiring, connecting Radio parts . . . building circuits with your own hands—you can't beat this method of learning. When you construct this Rectifier and Filter, Resistor and Condenser Tester, etc., you get a really practical slant on Radio that leads to a money-making future.

HERE'S THE LATEST, SIMPLEST WAY TO TRAIN at HOME for a GOOD LIVING in RADIO-ELECTRONICS & TELEVISION

I train your *mind* by putting you to work with your *hands* on a big 6-Tube Superheterodyne Receiver. And, believe me, when you get busy with real Radio Parts — 8 big Kits of them — you really LEARN Radio and learn it RIGHT! You get the practical stuff you need to be useful in Radio, and that's what it takes to make money. You don't have to worry about what to do with these 8 Kits of Parts. Step by step, I show you how to build circuits, test, experiment, trouble-shoot. And you don't need any previous experience. The Sprayberry Course starts right at the beginning of Radio! You can't get lost! Simplified lessons, coupled with real "Shop" practice, makes every subject plain and easy to understand and remember.

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Soon after you begin Sprayberry Training, I'll send you my sensational BUSINESS BUILDERS. You'll find out how to get and do neighborhood Radio repair jobs for nice profits and rich experience while learning. This sort of work can easily pave the way for a Radio Service business of your own. But with Sprayberry Training, you're not limited. You can swing into any one of the swiftly expanding branches of Radio-Electronics INCLUDING Radio, Television, FM, Radar, Industrial Electronics. Be wise! Decide now to become a fully qualified RADIO-ELECTRONICIAN. Get full details about my Training at once! Mail coupon below for my 2 big FREE Books.

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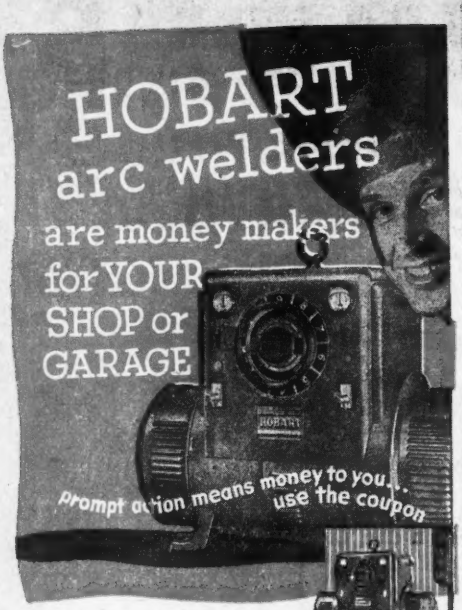

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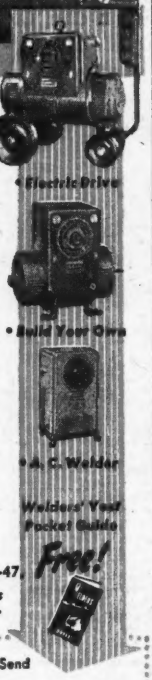

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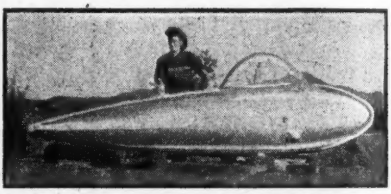
Editor's Workbench Chips

[*Continued from page* 12]

devices such as viewing glasses, polarized light, or other impedimenta are required to view the image. Basically, the process is similar to the old Kodacolor system wherein the film was treated with a fine lenticular surface. However, in this case the minute lenses produce depth instead of color.

In a nutshell, here's how the process works. A large lens records the image upon the film after it has been broken up by the lenticular surface. When the picture is viewed, the tiny lenses on the film act like a selecting screen and allow each eye of the observer to see only its respective part of a stereoscopic pair of images. The effect at this stage strikes a false note because the foreground will appear where the background should be. This, however, is corrected when the print is made on Trivision paper. The final result, we are assured, is stereoscopic. We understand that any commercial film can be embossed with these ridges or lenticulations.

HOMEMADE JET JOB



An ambitious project has been completed by Fred F. Wells of Prescott, Arizona. It is a jet propelled racing plane, 12½ ft. long made of ¼ in. steel. This little plane is expected to do 200 mph. We're sending you a Workbench Award and a $10 check. Let us know how you make out on your first flight, Mr. Wells.

Scientists Make Snow Fall

Scientists flying in an airplane over Greylock mountain in western Massachusetts succeeded recently in transforming into snow a cloud three miles long.

From a 14,000-foot level, the snow fell an estimated 3,000 feet, but because of the dry condition of the atmosphere beneath the cloud, the snow evaporated before reaching the ground.

In cloud formations of lower altitudes, which commonly prevail in winter, such a precipitation of snow would reach and blanket the ground, the scientists said.

Vincent J. Schaefer, of the General Electric Research Laboratory, was in charge of the test. Dr. Irving Langmuir, associate director

[*Continued on page* 16]

INVENTORS

Patent Laws Encourage The Development Of Inventions

The Rules of Practice of the U. S. Patent Office advises—unless an inventor is familiar with such matters—that he employ a competent registered attorney, as the value of patents depends largely upon the skillful preparation of the specifications and claims.

The firm of McMorrow, Berman and Davidson is registered to practice before the U. S. Patent Office. Additionally, it maintains a staff of attorneys able to readily understand inventors' disclosures, to advise concerning patentability, and to prepare appropriate specifications and claims for filing with the Patent Office.

If an inventor believes he has an invention, a search of the most pertinent prior U. S. patents should be made and a report obtained relative to its patentability. Where such report indicates that the invention appears patentable, in order to secure protection, diligence should be exercised in making application for a patent.

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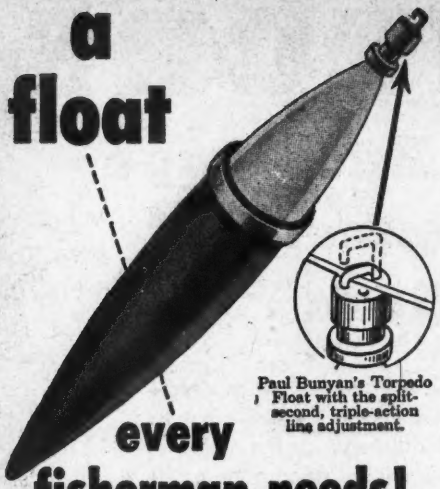

Paul Bunyan's Torpedo Float with the split-second, triple-action line adjustment.

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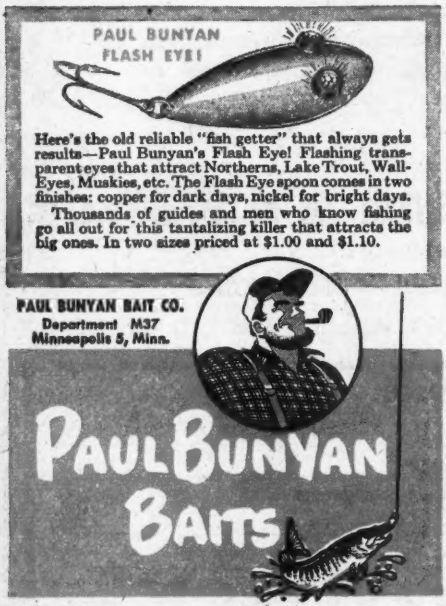

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Editor's Workbench Chips

[*Continued from page* 14]

of the laboratory, and others, watched from the control tower of the test center.

As the plane flew through a cloud, Schaefer dispensed six pounds of small dry-ice pellets over a tract about three miles long. The cloud transformation was quick, observers claimed.

Dr. Langmuir said that within two minutes from the time Schaefer signaled by radio that he was ready to begin, a radical modification of the cloud took place and streamers of snow began to pour out of the base of the cloud. "Though it was more than 50 miles away, we could easily see the snow with the naked eye," he said.

(See "Science in Pictures," page 94, MI, Feb. '47.)

THE MI NAVION

The little ship which Comdr. Robert L. Eller of the U. S. Navy is holding was built from plans which appeared in the October 1946 issue of MI. This little beauty is powered by a De Long 30 engine. The use of an electric starter and a built-in choke eliminates the need for a protruding needle valve thus yielding a smooth cowling. Congratulations on a real neat job; a Workbench Certificate plus a $10.00 check are on the way.

Plant Has Ten Sexes

The Elixir of Love, vainly sought by medieval alchemists, actually exists—for certain microscopic lower plants. It is a compound known as crocetin, together with a few of its chemical derivatives.

One part of this in 250 trillion parts of water will cause cells of the plant to quit a quiet,

[*Continued on page* 18]

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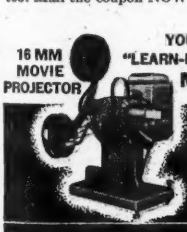

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Jerry, the talking dog, is entertaining hospitalized veterans, by courtesy of the PYROIL Company. Picture of Jerry, sent on request

Editor's Workbench Chips

[*Continued from page* 16]

sedentary, sexless phase of existence and become actively motile, mate-seeking cells.

The plant concerned is the one-celled lower alga called Chlamydomonas. Details of its astonishing sex-chemistry are presented in the new issue of the American Journal of Botany by Prof. Gilbert M. Smith of Stanford University.

The sex life of Chlamydomonas also presents another dizzying peculiarity. The clever poet who tossed off the couplet:

> Breathes there a man
> With soul so tough
> Who says two sexes
> Are not enough?

should have studied a little botany. This plant has not two sexes, but ten. It produces five types of female cells, and five of male, all reacting with different degrees of intensity to their opposite numbers. All of which makes life at that level rather confusing.

Hangar Roof That Floats

A hangar roof that holds itself up, needing no girders or other heavy, costly members to support it, is the invention on which U. S. patent 2,411,316 has just been issued to Emil R. Capita of North Bergen, N. J. As a matter of fact, the roof has to be held down rather than up, for it floats in the air like a balloon

It floats like a balloon because it actually is a balloon—a very thin, almost flat balloon It consists of a two-walled, gas-tight fabric structure, divided into cells for greater stability, and inflated with helium.

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Mr. Kraus has been giving advice to inventors for more than 20 years. He will attempt to answer as many letters from inventors as possible in his column each month. Mr. Kraus will "call his shots as he sees them" in this column. Thoroughly versed in inventions and inventions procedure, he will never, under any circumstances, disclose any valuable secrets. He cannot answer questions relating to patent law. For such information, the Editors suggest you communicate with any one of the patent attorneys who advertise in MECHANIX ILLUSTRATED.

Wobble Plate

Bob Catterson of Lincoln, Nebraska, submits a design for a steam engine in which the pistons bear against a plate mounted at an angle relative to the shaft.

ANSWER: *The suggestion of what popularly is called the wobble plate is very old. You will find it illustrated in technical books under the name of Bisschop's disc engine. You could use the general idea, we feel sure, but so could anyone else. We see nothing of value in your disclosure.*

Center Finder

G. G. Stone of Ada, Oklahoma, sends a design for a tool with which the center of the work can be found more easily.

ANSWER: *There are certain advantages to be found in this tool but the good points are counterbalanced by the weaknesses. For one thing, it takes too long to make an adjustment.*

A hermaphrodite caliper or a center head on a scale will do the job in one tenth the time. A tool similar to a compass but with one stationary middle leg and two adjustable outside legs will perform the task with greater facility and is instantly adjustable without necessity of close readings.

If you think that the flat foldable feature of your instrument would hold values sufficient to offset the manipulations required for adjusting you might investigate the field further. But great caution is urged. The item does not appear to be a sure-fire hit.

Trig—Slide Rule

G. N. Houck of Wichita, Kansas, wants to know if his suggestion for an indicating rule to give trigonometric functions is worth anything.

ANSWER: *From your diagram we would be inclined to hold that this needs considerable further thought. First the tables must be set up properly, then it appears that the moveable arm must be located with absolute precision.*

It should be perfectly possible to test your item on a rather inexpensive production basis. The scale can be made on a photographic negative. Duplicates may then be printed by usual photographic means. Some sort of a jig to establish the bearing point and center the arm would seem to be required. But the entire production could proceed in your own kitchen or cellar.

We would suggest that you devote some time and study to this; that you lay out the original; that you have a search made to determine patentability; and that you then spend some more time on making the master from which to reproduce your finished product. You may even be able to sell your invention to a manufacturer of calculating scales, so everything appears to argue in your favor.

Film Holder

William J. Leary of Somerville, Massachusetts, submits a design for a film holder which offers other advantages.

ANSWER: *In keeping with our policy of not disclosing details of an item which we consider of possible value we must also refrain from offering some suggested actions in this printed answer.*

Briefly, we think that this design can stand further improvement to make it more useful and to permit it more completely to fill the intended purpose. Then much experimenting should be done to make sure that the item works properly. If it does not need to increase in size and yet will function as intended, further action might be recommended.

Selling An Unpatented Invention

Charles H. Morse of Brooklyn, New York, asks several questions relating to the sale of unpatented inventions.

ANSWER: *You could pose the same questions and apply them to thoroughly protected inventions. Nothing will prevent an unscrupulous manufacturer from making and selling your invention. When you discover it you can file suit for an accounting. Then the manufacturer closes his plant, moves across the street and starts another business. So you can*

[Continued on page 22]

ADVICE *for the* INVENTOR

The United States Patent Office advises the inventor, unless he is familiar with such matters, to employ a competent, registered patent attorney since the value of a patent depends largely upon the skillful preparation of the specifications and claims set forth in his application.

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The Evidence of Invention form mentioned below is offered as a convenience to the inventor in making his disclosure of invention. The inventor should date and sign his disclosure and have it witnessed by two or more persons who are capable of understanding his invention. The disclosure should then be mailed together with the inventor's authorization to conduct a preliminary search at the U. S. Patent Office among previously granted U. S. Patents for similar types of invention. A report is then prepared on the probable patentability of his invention and a recommendation made as to the further course he should take in regard to his invention, provided that the patentability report indicates possible patentability.

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Your Invention Clinic

[*Continued from page 20*]

sue again. The only difference appears to be that if you have adequate protection you can establish a basis for suit. For success you should deal only with reliable concerns, and the time to investigate is before you make any disclosures or sign any contracts.

Can Opener

Joseph N. White of Hazel Park, Michigan, wants to know if his patent is worth manufacturing and inquires about what its price should be to make a reasonable profit.

ANSWER: *On the average you should sell your product for about five times its manufacturing cost. Remember that the dealer will require a discount of about 40 to 50 percent. The jobber demands 10 to 15 percent. So at least half of the established price goes into the cost of selling. The balance must cover all your costs and profits.*

Clothespin

Albert J. Duncan of Carlyle, Illinois, submits a design for a double spring type clothespin.

ANSWER: *We would suggest that you have this design searched. It is our opinion that this was marketed before, but was basically used for hanging cut films. There may be chance for some coverage.*

Radio Speed Trap

Edward Johnson of Detroit, Michigan, claims to have designed a radio device which should reduce speeding. The answer clarifies some of his inquiries.

ANSWER: *It may be possible to protect the general idea but we certainly would not suggest such action.*

You never could cause legislature to pass laws requiring all car owners to install devices which automatically would penalize them and subject them to arrest and fines or prison sentences, should the speed laws be infringed.

You probably never could make your device function as you expect it to even on an ideally constructed new model. It would be much cheaper and you would have better protection if photo electric speed traps were located on the right of way which is to be covered by such control, and such devices would function regardless of the condition of the equipment in the owner's car.

The train control prevents the loss of life and property. Your device will do neither. We have never seen any proof of the feeling exhibited by some that fast driving is reckless driving. On the contrary, a fast driver often is more alert, more responsive, and knows how to use brakes or accelerators.

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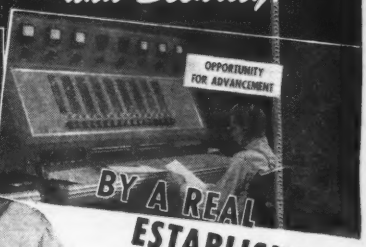

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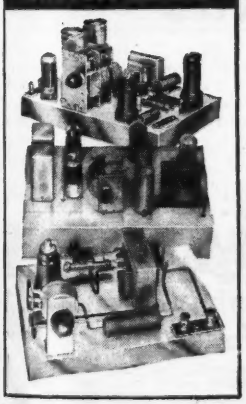

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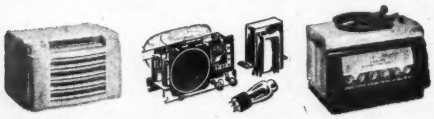

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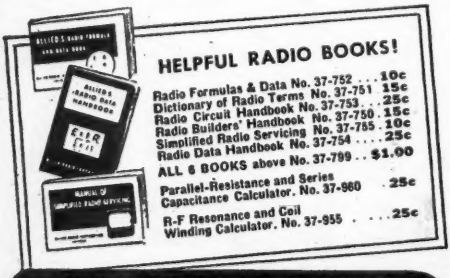

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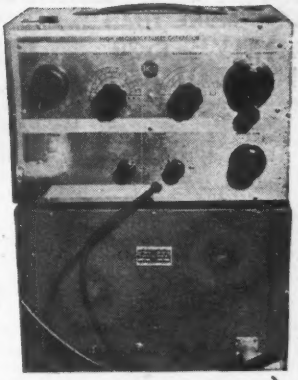

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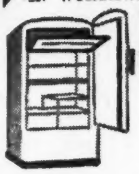

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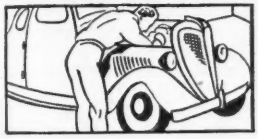

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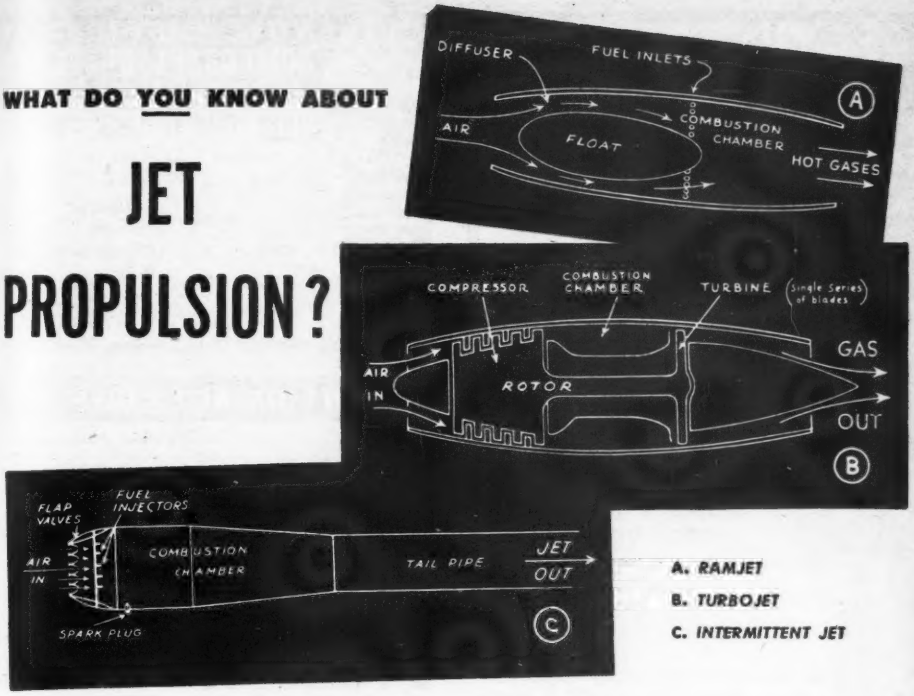

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C. INTERMITTENT JET

IF YOU KNOW even the lone guiding principle, you're far and away ahead of the average American citizen!

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A. Compression of a gas to a high pressure in a confined chamber, and conversion into a high-velocity gas stream expelled into the air.

Q. *Are all Jet devices the same?*

A. No. The three types used on aircraft are the Ramjet, Turbojet and Intermittent Jet.

Q. *Can any of these drive a plane out of the earth's atmosphere?*

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Q. *Can any of these start from a standstill under its own power?*

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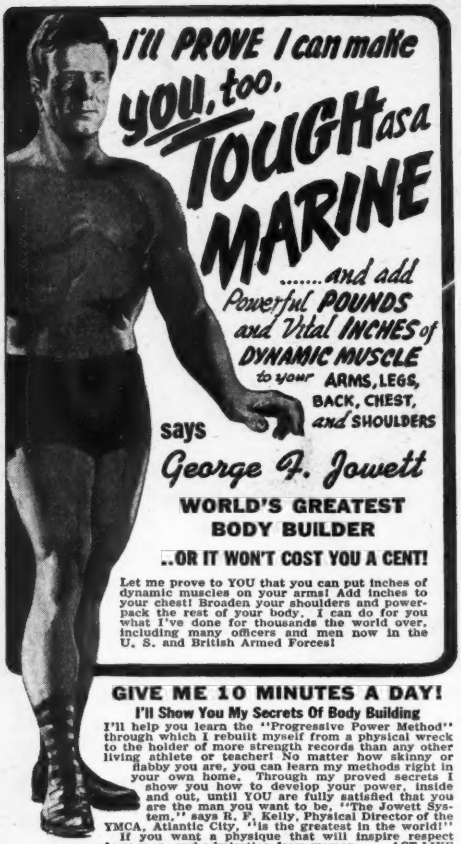

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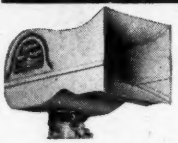

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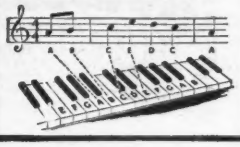

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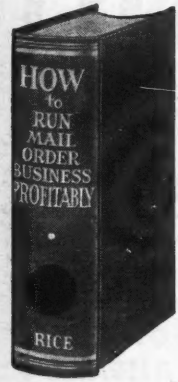

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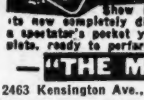

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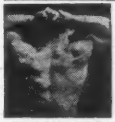

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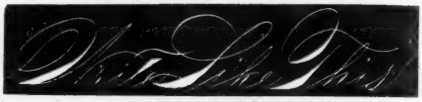

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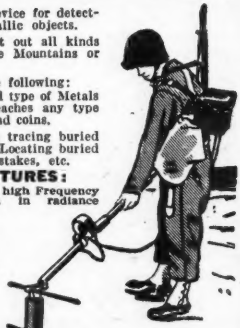

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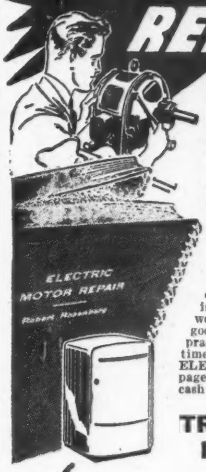

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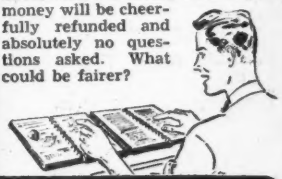

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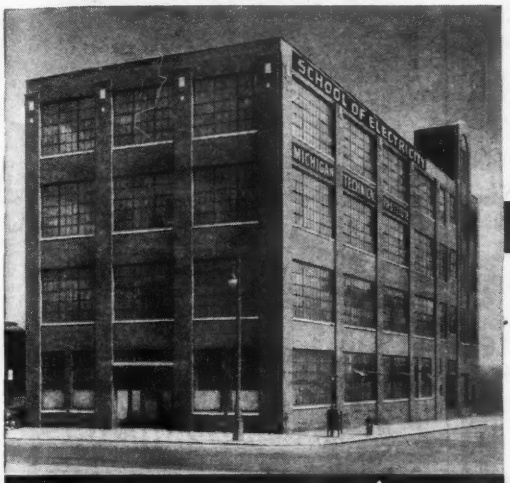

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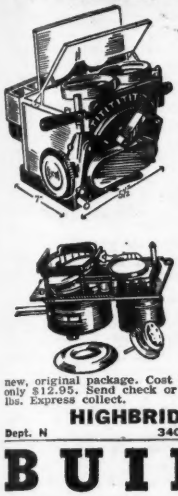

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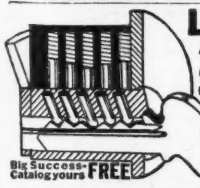

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mechanix illustrated
april 1947

AIRLINERS NEED NOT CRASH!

BY GILBERT PAUST

War-born inventions, if used, could make air travel really safe . . . yet planes crash . . . and people die. . . .

AMERICANS have a new slogan and it's not a pleasant one to the air transportation industry. It goes, "If You Have Time to Spare, or Just Don't Care, Travel by Air!"

This slogan is heard most often late at night in the sleepy lunchroom of some airport where bench-sore airline "travelers" sit out the whimsies of the weatherman.

Outside, on the ramp, millions of dollars' worth of aircraft are also sitting it out. "Upstairs" other millions of dollars' worth of complex aircraft are either "stacked up" over the field waiting their turn to make a try for it, or flying on over to another field where they can land—they hope. Unless the weather is good at *both* ends of a scheduled flight and the planes can take off and get back down again close to schedule, the passengers are stuck, the aircraft is stuck, and indirectly all aviation is stuck. No wonder the railroads advertise, "If you *have* to be there, take the train!" and, "When the weather says *no*, the train says *go!*"

For the good of the aviation industry and the future of all commercial transport flying something had better be done, and fast. During the war when radar was the magic word and FIDO (Fog Intensive, Dispersal Of) and all the other top-drawer navigation and air-safety means were under military lock and key, we said, "That's O. K., but after the war we'll have them at all our fields and on all our aircraft. We'll be coming in right on the button in zero-zero weather, and weather holdups will be a thing of the past. Radar will keep our ships away from mountains, tall buildings and each other." We were tickled to hear about GCA (Ground Control Approach), developed by the Army and Navy during the war, VHF (Very High Frequency) radios to keep perfect radio contact regardless of static and distance, and such things as LORAN (Long Range Navigation), Teleran, Navaglobe, Navar, Navaglide, Navascreen, and so on, all promising a new era in air travel and safety.

A year ago I picked up a booklet published by the Air Transport Association of America dealing with scheduled air travel. The center spread shows a dozen safety devices and the heading reads, "It was inevitable that the seeds of saftey, sown in war, be reaped in peace—and today's air transportation is the safer for research and invention"—followed by the big word SAFETY! The implication is that the various devices shown are regular equipment on our airliners and at our fields. Let's look at some of them: Airborne Radar (terrain), Airborne Radar (horizontal), Radar Landings, Radio Altimeter, Localizer Beams, LORAN. Who's kidding who? The crews of most of our

air transport planes will be amazed to know about this equipment hidden away in their cockpits all the time.

At the bottom of the spread is a four-engine transport with all the "Built-in Safety" devices marked. They include a "bird-proof windshield" (I've always worried about that) and "wheel brakes."

A year later, and almost two years after the war, what *do* we have? Well, at first glance we seem to have some highly expensive confusion. On second glance we still have it. Some of the airlines want one type of blind landing equipment. Other air travel systems want another. The CAA (Civil Aeronautics Authority) wants still another. The services have their own ideas about bad weather flying (and they seem to be good ones). We keep reading about new devices that "mark great forward steps in air safety and all-weather travel"—but then they are apparently dropped, and work started on a later model, and then a later. Why don't they stop trying to go the competition one better and *give* us some of these devices. Way before the recent war I saw a demonstration of the Radio Altimeter, or, what they called at that time, Terrain Clearance Indicator. It has just been announced that the tragic crash of that giant Constellation in Ireland at Christmas time was due to the fact that the altimeter was showing 500 feet of air below them *when they plowed into the swamp* (according to the testimony of the captain and co-pilot from their hospital beds). Oh well, perhaps the better type was more expensive.

What aviation needs is someone to take all agencies by their collective necks and say, "Look, Bub, we've read about all we want to about airline crashes, planes burning, running out of gas with no place to sit down and trying to drill holes through granite mountains with a dural nose. Let's cut out the politics, fancy phrases and

Here pictured are some of the aviation developments that were to have made postwar flying safe.

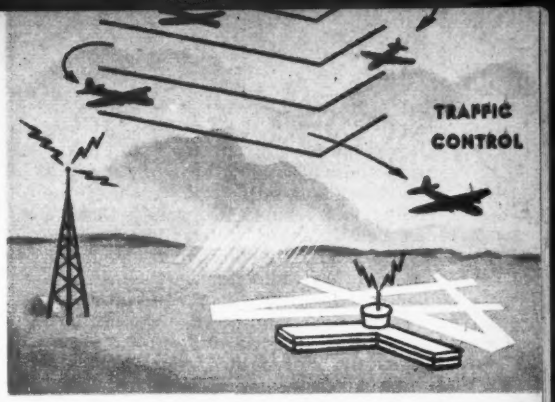
opening of new routes and first of all make the routes we now have safe."

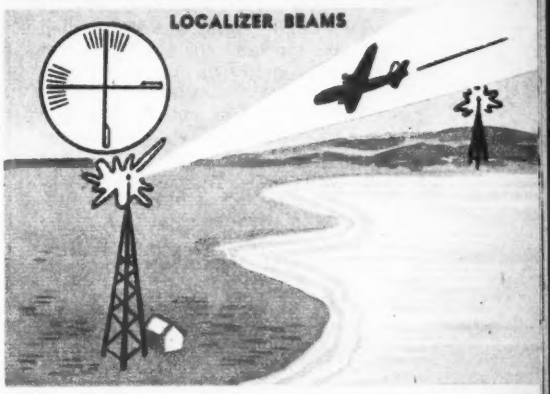
The bigger the transports become the greater the number of passengers that will be wiped out when they crash. Well I remember seeing for the first time the full-scale mockup of the commercial version of the giant B-36. As the group of aviation writers strolled through the 200-foot double-deck cabin and heard that it could carry 400 persons in a pinch, you heard expressed on all sides, not what a wonderful ship it was to be (and it *will* be), but what a hell of a crash it would make! The same thought applies to any bigger and better transport. Anyone who has picked through the pitiful scraps of what was once a giant airliner and stepped around what was once youngsters and nice guys and gals can't help but translate size in new airliners into terms of impact, airframe collapse and cut-short screams.

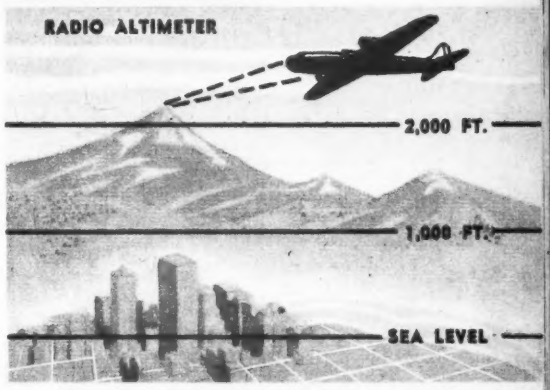
True, many of the airliner accidents have been among the non-scheduled operators, but all air transport accidents reflect upon all air carriers, and how does the radio listener or the newspaper reader tell the difference? A crash is a crash, any way he reads or hears about it. If the non-scheduled (so-called because they publish no timetables even though they run regular flights between terminal points at about the same time every day and run charter flights on the side) operators are to continue in business they too must live up to the promises of safety we have begun to wonder about, and the scheduled operators must go out of their way to help these "charter" transports keep their safety record up near the top, competition or no competition, for the good of all parties.

One prominent airline points with pride to the fact that it has not had an accident chargeable to equipment failure in over five years. Last year this airline had three crackups with a total of 25 deaths. A crackup is still a crackup, whether due to mechanical or pilot failure.

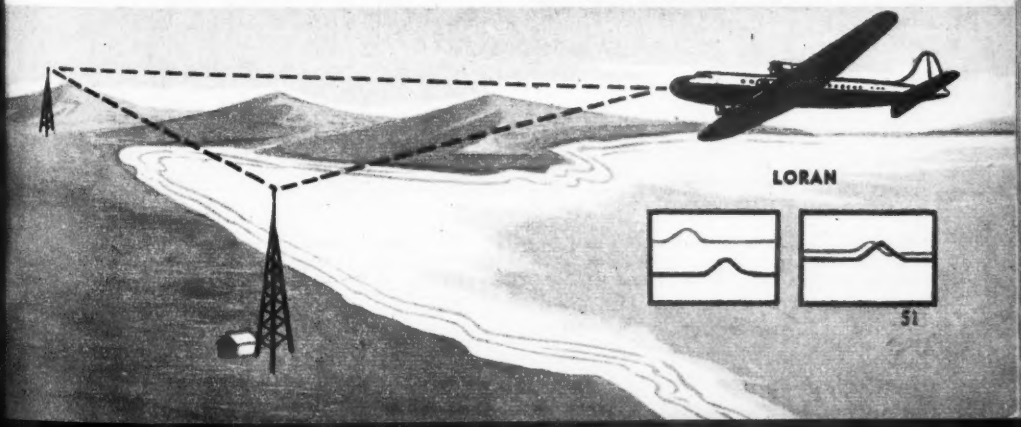
During the war the Air Transport Com-







Drawings adapted from Air Transportation



mand boys and the crews of the Naval Air Transport System flew millions of miles all over the world from the Hump in India to the stark wilderness of Labrador and Greenland without a tenth of the navigational beams and markers that we have here in these United States. Those "fly-boys" flew by damn good navigation plus what few radio aids wartime restrictions would permit. I've seen four-engine stuff come sliding down into military bases through "horizontal snow storms" so thick the "Follow me" jeeps were using seeing eye dogs, and it was merely routine.

A recent tragic crash of a scheduled airliner was reported to be due to the fact that the radio beam was "inoperative"—and the ship was 60 miles off course. Granted it doesn't take long to cover 60 miles in a modern transport, it still seems that getting that much off course and plowing into a church graveyard is hardly the thing to keep the passenger lists full.

The crews of our transports are the cream of the crop, highly trained, in perfect physical and mental condition for their exacting jobs, and yet they crash. You can bet your bottom dollar they're as anxious to live as their passengers, and you can bet they use every trick at their command to keep coming home to supper—but still things happen. Another plane lands on a beach, only a few miles from two or three airports. Had he figured his gas load wrong? Was he lost? Had he spent too much time stacked up and so had too little gas to reach an alternate field? Planes plow into mountains, ram buildings, overshoot fields, and catch fire aloft. Great stuff, air travel.

After being cleared and reaching his appointed altitude (even thousands going west, uneven going east) the pilot is expected to stick to his flight plan, come what may. Should he change altitude he must be first cleared to a new altitude via radio. That takes time, and at modern transport speeds plenty can happen during the time he is asking permission to climb over what may be right ahead of him. If a pilot isn't sure where he is and has an idea there may be mountains or other obstructions ahead he should be

This airliner took 14 passengers on an unscheduled trip through a steel fence, across a street, and into a vacant lot.

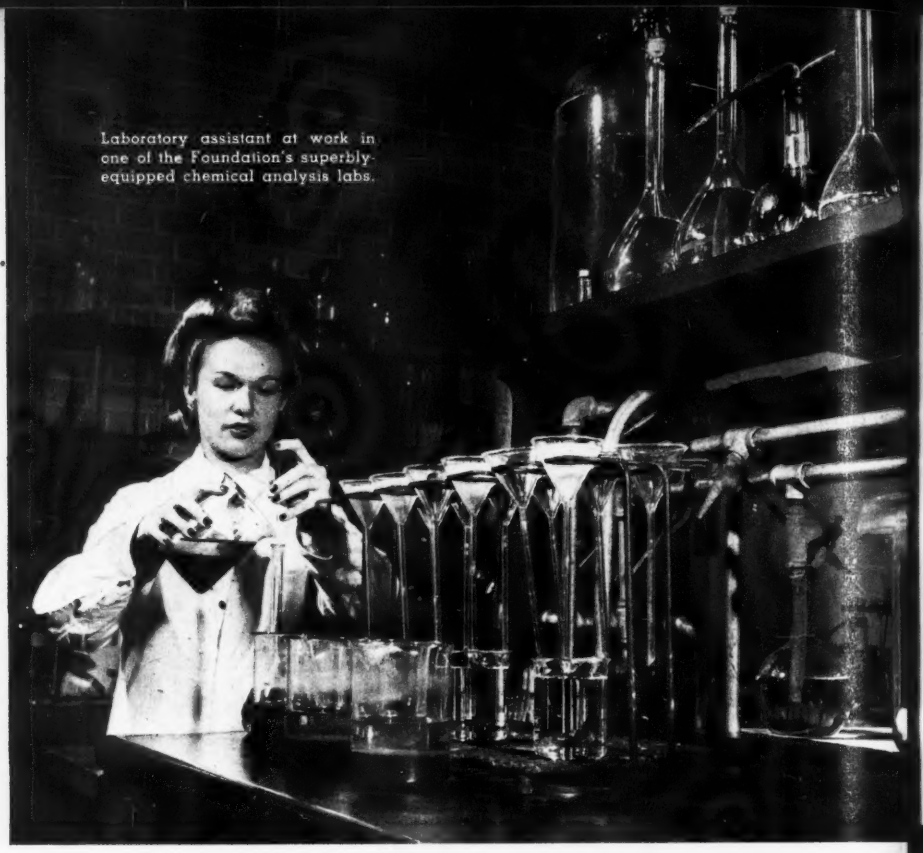
Right, awaiting an ambulance . . . amid the rubbish of what was a magnificent airliner only a few minutes before.

A huge transport burns fiercely after landing at a Chicago airport. All the 41 persons on board escaped injury.

forced under these circumstances to go higher, and fast, to a point where there is no doubt about his clearing anything ahead. Few pilots have the chance to say, "Next time I'll go higher!" In New Jersey any pilot or driver of a public transportation vehicle involved in an accident resulting in passenger death is holdable on a manslaughter charge. Why not? If the pilot is proven to have been negligent he should be punished.

On a flight from Boulder City, Nevada, to Winslow, Arizona, a few years ago, on a regular schedule daytime flight, my ship approached a mountain ridge with every apparent intention of going through it rather than over it. The wind was against us and all we needed was a down-draft pouring over the ridge to have finis written right there, as any pilot with soaring experience knows. It happens we slid safely over the ridge through a narrow notch; but I was so sure it was going to be close that I snapped my camera just before, to register a bit of evidence, in case. Why did we have to come so close to a ridge with the whole CAVU sky above us?

The late Major Lewin Barringer, ex-U. S. Soaring Champion and power plane pilot, had a similar experience. He and his wife were flying in an airliner across a mountain ridge where he had flown motorless craft. One ridge in particular he knew for its dirty down-drafts beyond. As they approached the ridge he suggested that they both fasten their belts. Sure enough, the transport sailed out over the ridge and down into the valley with the down-draft, while the passengers floated through the air quite without the [*Continued on page* 166]



Laboratory assistant at work in one of the Foundation's superbly-equipped chemical analysis labs.

trouble busters

You toss them a tough problem and they toss back a tender solution.

BY MARGOT PATTERSON

"NO POTATOES," the grocer said grimly.

"No potatoes?" the housewife exclaimed with emotion. "Why, I must have potatoes! My family needs potatoes!"

"Sorry, lady," the grocer said. "There's a shortage. It's on account of the rot."

Until 1938, this little scene was re-enacted annually all over the United States. Bacterial soft rot baffled shippers. It would spread through whole carloads of potatoes, causing losses of millions of dollars. Finally, the shippers put the problem in the hands of the Armour Research Foundation.

The Armour men promptly brought forth a new dryer. A conveyor belt carried the potatoes through a hot-air blast which dried and altered their skin condition and prevented penetration of the bacterial invader. This technique cut the frightful annual loss.

Armour Research Foundation makes a business of solving other people's problems. It will tackle headaches in any worthy field and tell you why your machines break down, how long a suit of clothes will last, the quickest way to assemble the parts of a watch, how fast your heart will beat if you jump from a plane at thirty thousand feet, or, if you like, the behavior of

lubricants under the tremendous hydraulic pressure of 1,500,000 pounds to the square inch.

A bright idea, a lot of enthusiasm and very little cash launched it in 1937. The idea was a simple one. Giant corporations had their own laboratories to solve their problems but the small businessmen, faced with similar problems, were out of luck. They couldn't afford to maintain even one technician. So the Foundation was started with the idea of giving the "little man" a break.

With a scanty supply of equipment and the blessings of the Illinois Institute of Technology, three willing young scientists set themselves up in three rooms of an ancient apartment house and asked for tough problems to solve. People laughed, but once the Foundation started it boomed. Tales of the unique organization spread, and new clients beat a pathway to the ugly red brick building on Chicago's South Side, as Harold Vagtborg and his associates licked one tough problem after another.

Business came from far and wide. And not only small business. Executives of large corporations were frequent visitors. Where their own laboratories had failed they were willing to try anything. The Foundation almost always came up with the right answer. Amazed and grateful, these executives showered the young men with equipment and materials.

Today 200 scientists carry on their work in several well equipped buildings. More than 1,500 clients have been served. The astonishing number of 4,000 research tasks have been undertaken, saving millions of dollars for private industry and the Government.

There is very little of the orthodox about the Foundation. Its members read all there is to read about a subject, then toss aside the textbooks and tackle the problem from the beginning. This open-minded approach speeds the solution and keeps the Foundation from old and futile lines of thinking.

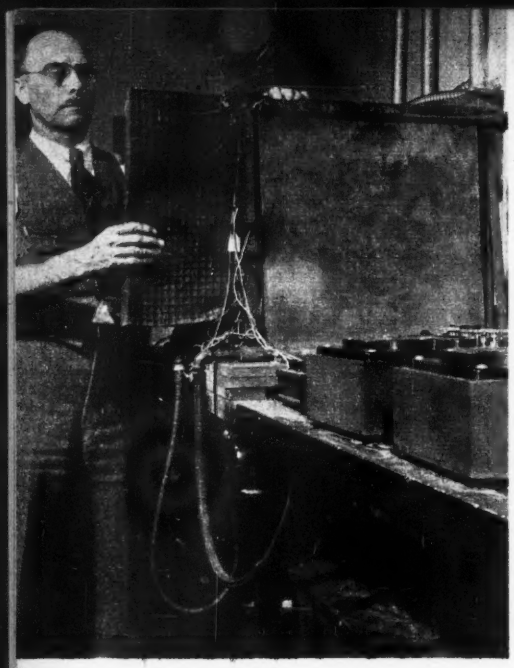
"For years we have been told that such and such is so. But is it so? Let's prove it, or try to."

When the Foundation finishes a research task for a client the theories, methods and patents on it belong exclusively to that client. None of his competitors has access to the findings. If he makes a fortune from the discoveries, well and good. The organization is run on a non-profit basis, asking nothing but a modest service fee, agreed upon in advance. The staff estimates the approximate cost of materials, tools, equipment, salaries and overhead, and this is the fee it charges.

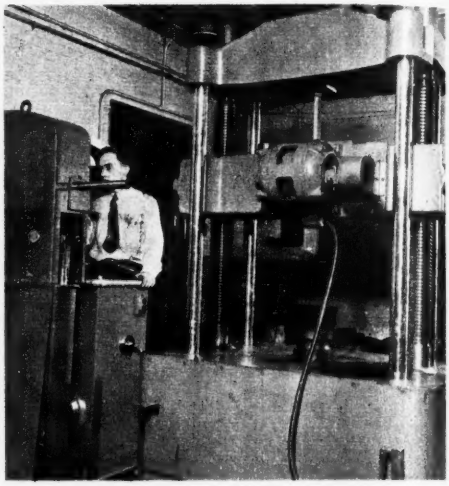
Sometimes a baffling problem can be settled in ten minutes and sometimes a dilemma that looks simple on the surface will take a year of careful study. Teamwork is the keynote of the

Recording the playing technique of a skilled clarinettist on high-speed film.

Electrical calculator which in one hour can do math problems ordinarily requiring 1500.



Left, lab technician inserts piece of material into device which will test its insulating qualities. Below, technic. bends a metal bar in a strain-testing apparatus.



Foundation's success. The Armour Associates don't believe in "too many cooks spoiling the broth." If two heads are better than one, then three are better than two. Round table discussions—fact finding from many angles—go on daily. Often new tools and new methods must be invented to deal with a problem that won't yield to known methods. When this happens, the man with the idea doesn't hesitate to call upon metallurgists, electrical experts, mechanical engineers, chemists, or any other staff members. The answer may end up looking like something out of Rube Goldberg, but it works. Their group research means speedy results. And better ones than the lone genius in the garret can produce.

The staff is a collection of able young scientists. Its director and executive members are all in their thirties. They are constantly on the lookout for up-and-coming youngsters completing their technical training. They say that young blood and young ideas go hand in hand, and young ideas keep the Foundation on its toes and make it the success it is.

Plain horse sense solves many a problem, as in the case of the leaking fountain pen. Business executives who traveled by plane were apt to find that they had a pocketful of ink when the trip was over, because at high altitudes the air pressure was too low to keep the ink in the pen. It wasn't long before a manufacturer brought this problem to the Foundation. The Armour technicians tackled it with exhaustive care. They made every test and experiment. Then, suddenly, the answer struck them: Why not give the pen two reservoirs, one connected to the other? At low altitudes the ink would stay in the main reservoir, at high altitudes it would leak into the secondary one.

But horse sense doesn't work all the time. Complicated problems need a great deal of time, study and sometimes new equipment. Certain tiny parts used in watch making had been causing the makers of watches a heavy annual loss. At one point in their manufacture the parts had to be subjected to heat. No matter how much care was taken, all but a fraction of them were ruined in every trial. They would stick together, fuse into a solid mass and become worthless. The industry, both here and abroad, looked on this waste as inevitable and just added the cost to the price of each watch.

Dr. C. N. Challacombe, the Armour staff physicist, found the answer within a month. He dreamed up a novel method of heat treatment with a more satisfactory furnace-atmosphere control, and built it. The new equipment produced perfect parts in trial after trial.

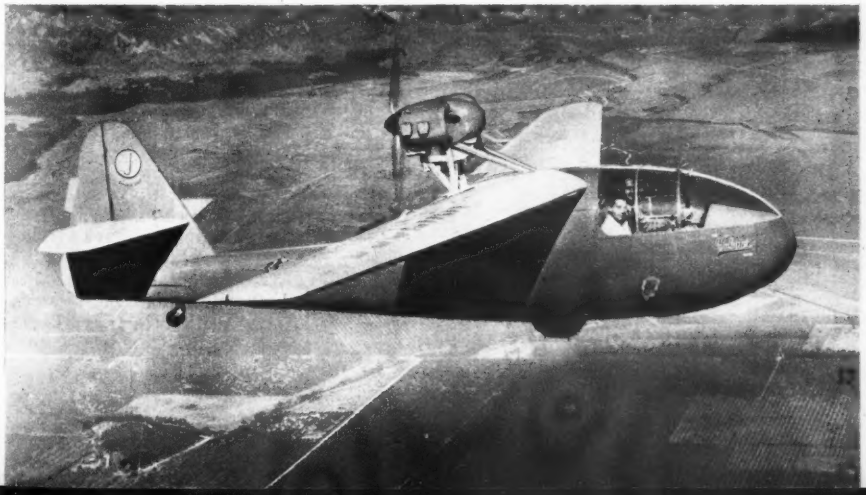
"How can we reduce the amount of tin in tin cans?" manufacturers asked. The young scientists [*Continued on page* 88]

Detector formerly used to locate enemy mines finds a novel peacetime use at left. A copper box containing 100-year-old records placed in the masonry of a Wellesley, Mass., church was lost until the mine detector was called in.

Drive-in Bank in Chicago's loop area enables motorists to drive right into the bank, make deposits or withdrawals and drive away—all without getting out of their cars. Yes, the glass is bullet-proof.

One-Wheel Landing Gear of Volmer Aircraft's VJ-21, a new all-metal low-cost sports plane, makes it possible to land and take off on rough ground. The three-passenger coupe, designed by Volmer Jensen, is powered by a 75-hp Continental motor mounted behind the passenger compartment. It has a cruising speed of 110 and goes 25 miles per gallon.

Race-Car Radios provide speedsters with two-way contact with their pit crews. Above, H. W. Mitchell, well-known race driver, tests his Raytheon radio equipment before a trial spin on the track at Indianapolis. The master equipment is set up in back of a truck.



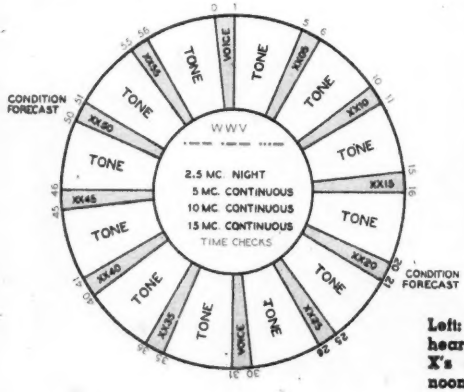
STATION T-I-M-E

Got a short wave set? You can get the time accurate to .00001 secs!

BY LAWRENCE LeKASHMAN

Above: Taking a time check by radio from WWV, Washington, D. C. This set is a Hallicrafters, SX28A.

ACCURATE time checks, instantly available, day or night, are easily obtained by anyone with a short wave receiver! Special, continuous radio signals are transmitted for this and other purposes by the United States Bureau of Standards radio station WWV, in Washington, D. C. Accuracy to one part in 10,000,000—and even better—makes WWV's transmission the most precise in the world!



Left: Here's what you hear during each hour. X's are hours—12 at noon, 24 at midnight.

Transmitters, capable of delivering ten thousand watts, broadcast on four different frequencies. No special receiver attachments are required. Any short-wave set capable of picking up WWV is satisfactory. Signals are sent out on 5 megacycles (5,000 KC), 10 megacycles (10,000 KC) and 15 megacycles (15,000 KC) continuously; 2.5 megacycles (2,500 KC) from 7:00 A.M., EST and (0000-1400 Greenwich Civil Time).

When you first tune in WWV it will sound like a steady tone, with a faint tick in the background every second except the 59th second of every minute, unless you happen to start listening during an identification period. The steady tone, which consists of two standard audio frequencies, 440 and 4,000 cycles-per-second, are interrupted precisely on the hour and each five minutes thereafter. After an interval of exactly one minute the tone is resumed. During the minute free from the presence of the audio frequencies (tone) the time period is sent in international Morse telegraphic code. For the remainder of the minute only the seconds ticking off will be heard.

The seconds time interval marked by the pulse every second is accurate to 0.00001 second. The pulse itself is of exactly .005 second duration. The 1-minute, 4-minute, and 5-minute intervals, synchronized with the seconds pulses and marked by the beginning or ending of the periods when the audio frequencies are off, are accurate to one part in 10,000,000. The standard frequency broadcast service makes widely available the national standard of frequency which is of value in scientific and other measurements requiring an accurate frequency.

To assist in positive identification of WWV, especially for the listeners who might experience difficulty in understanding the code, detailed voice announcements are made on the hour and half hour. These announcements will be of special benefit in locating the signal for the first few times.

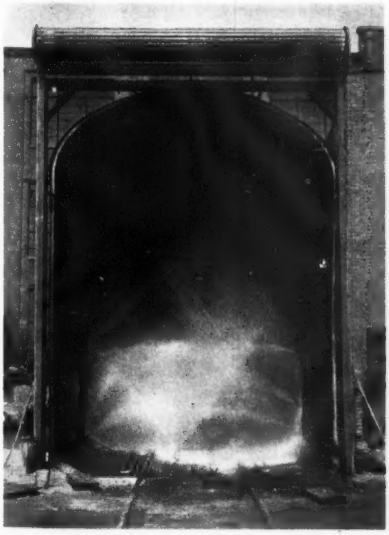
An additional service of WWV is to give a forecast on radio conditions over the troublesome North Atlantic path. These forecasts are at 20 and 50 minutes past the hour and cover the following 24-hour period. The time announcement which is given in code, is followed by either a group of 6 W's or 8 N's. Normal or quiet conditions are indicated by the N's, while a disturbance either in progress or forecast is indicated by the W's.

On many short-wave sets it will be found that the signal of WWV will not come in on exactly the dial setting it should. This will give an accurate check on how far off the dial calibrations are. It will thus make it considerably easier to locate other stations. In most instances WWV will be coming in close enough on the scale to locate easily. Having once heard WWV, the distinctive signal is easy to identify.

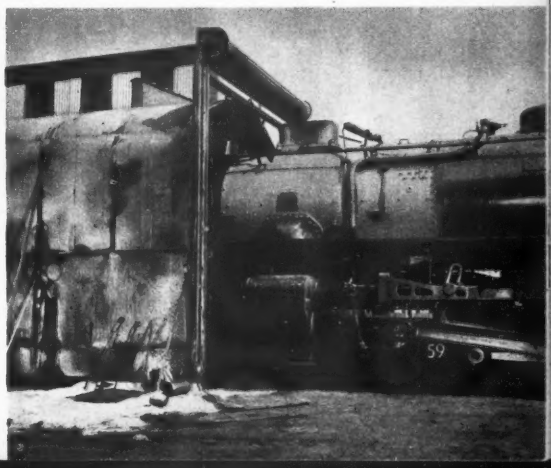
If WWV is not heard on the first frequency tried, one of the other stations should be monitored. If your receiver is capable of limited coverage only, it may be necessary to try at a different hour altogether.

During the day, 5,000 or 10,000 KC are the best frequencies for reception.

LOCOMOTIVE SHOWER BATH



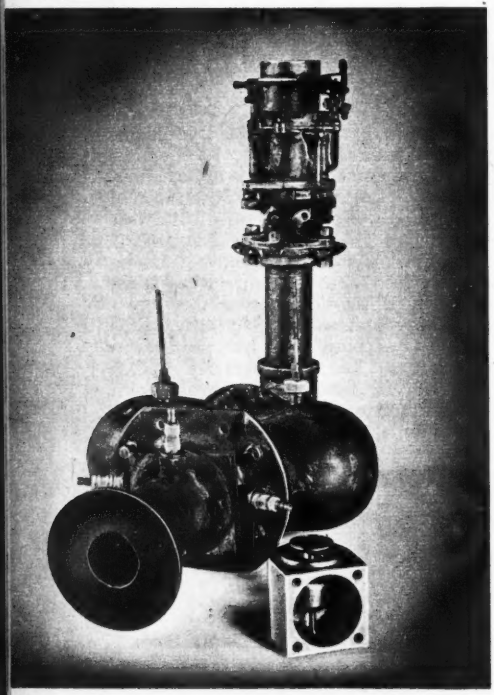
WITH the turn of a valve, the Union Pacific Railroad gives its largest locos a chemical shower bath and cuts to a fraction of its former figure the cost of stripping grease and paint from its hundreds of iron horses. Until two ingenious engineers, J. R. Frohoff and K. J. Glasmann, designed the automatic washing rack shown here, 192 man-hours were spent dismantling a single locomotive into parts small enough to be cleaned. Now the whole cleaning job is accomplished by one man in about two hours. The cost, formerly $250, is now only $75. Furthermore, officials point out, the rack turns out a much cleaner job than the hand method.



That's the iron horse's shower above. As you can see, he gets it from all angles.

Right: This loco will be clean as a whistle in 2 hours—job used to take 8 days.

jet engine for your car



Top: Henry C. Carney, whose firm sponsors inventor Kafka, takes notes on first rough working model. Above: Close-up of the jet engine.

THE jet engine for automobiles is no idle rumor. Here *is* one, pictured on these pages—and it runs. The inventor is a young engineer, Robert Kafka, of the firm of Carney Associates, New York City.

Kafka has been working on his invention for ten years. His success is signalled by a report that the Army Air Forces Command at Wright Field has ordered three of the engines as soon as they can be built and delivered. The Air Forces will probably use them to start conventional turbines for airplanes, however, rather than to power automobiles.

Setting Kafka's unit apart from all other jets and gas turbines now in use is the fact that it requires no blower or compressor unit. In most gas turbines at least half of the power extracted from expanding gases is used up in driving the compressor. Kafka says he loses only about 10 per cent of his power to the function of charging.

He accomplishes this by making his firing chamber in two parallel cylinders, both opening into a diverging nozzle. As one cylinder is fired, the expanding gases, passing into this nozzle at high velocity, create a vacuum in the other cylinder. This sucks in a new charge for the second cylinder—the function performed by the separate compressor unit in other gas turbines and jets. As the second cylinder fills with fuel-air mixture, it is ignited by flame from the nozzle.

Kafka uses a conventional automobile carburetor to mix his gasoline and air. It is

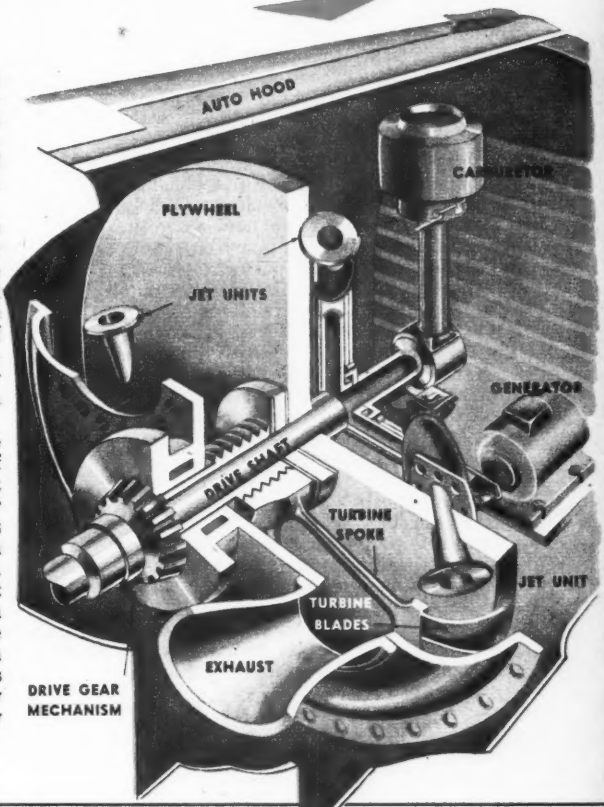
here's a preview of tomorrow's automotive power

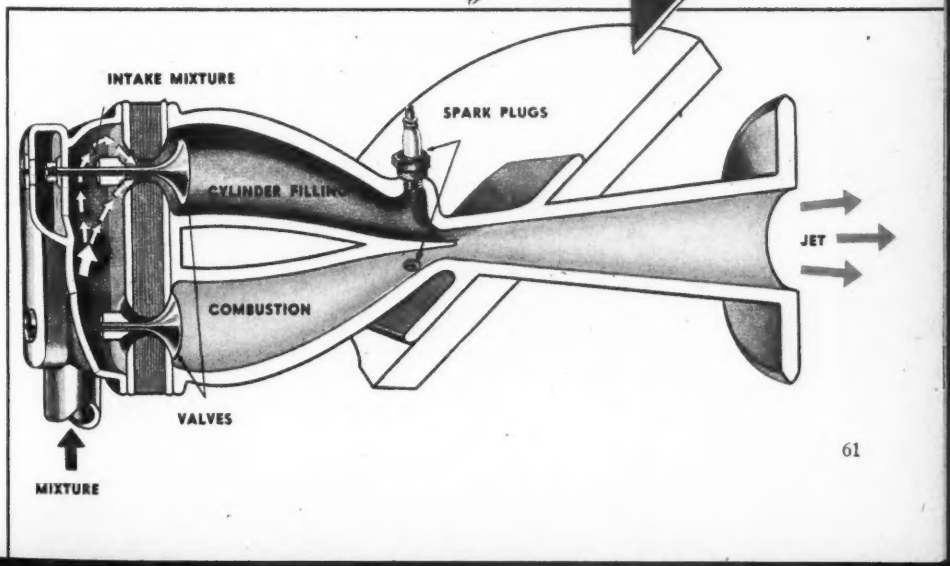
drawn into each cylinder through a valve, and these are the only moving parts of his machine. The throttle gives him complete control of speed, another feature of his invention that is of great importance.

The Kafka basic nozzle works by induction. The firing chamber draws the fresh charge into the opposing chamber with a powerful force which measures as a static vacuum of as high as 15 inches of mercury or about seven and one-half pounds per square inch under atmospheric pressure, as tested in the Carney laboratory.

There has been considerable speculation as to the efficiency of this effect. It is an established fact that the efficiency of an injector (whose principles apply here) is effected by the difference in masses of the fluids involved. Thus, if the driving fluid is light (as with steam) and the driven fluid is heavy (as with water), the efficiency of the injector will then be low, but when the two fluids are of the same mass with properly designed orifices, the efficiency

BY GOLD V. SANDERS





will be high. This has been borne out in laboratory tests.

At this stage, Kafka is completely satisfied as to the principle of his invention. It works. He is now building a new, more compact model, with a different valve arrangement. It is not the alternating combustion principle that has given him trouble, but the problem of making the valves work smoothly.

Of course, the purpose of this, like other jets and gas turbines, is to create power more economically. It has long been recognized that the gas turbine holds promise of the cheapest power. Incidental problems have prevented full realization of these potential power sources. Fairly efficient gas turbines are now at work, here and in Europe, and many engineers are giving full time to perfecting them.

Kafka says he has theoretically a motor of 50 lbs. weight that can deliver 100-hp. His first model is much heavier than this, in proportion, but the weight is not there from necessity but for convenience in building it by hand. In a three-hour run his twin-cylinder jet used about a quart of gasoline. It was running at three cycles-per-second, that is, three explosions from each cylinder, which is very slow. He expects his new model to operate at 30 cycles-per-second.

This new kind of jet power differs from others in that the power comes in pulsations rather than being continuous. Kafka says it sounds like a motorcycle. To smooth out this flow of power, he visualizes several jet units acting on a common shaft with impulses synchronized, like the firing of multiple-cylinder internal combustion motors.

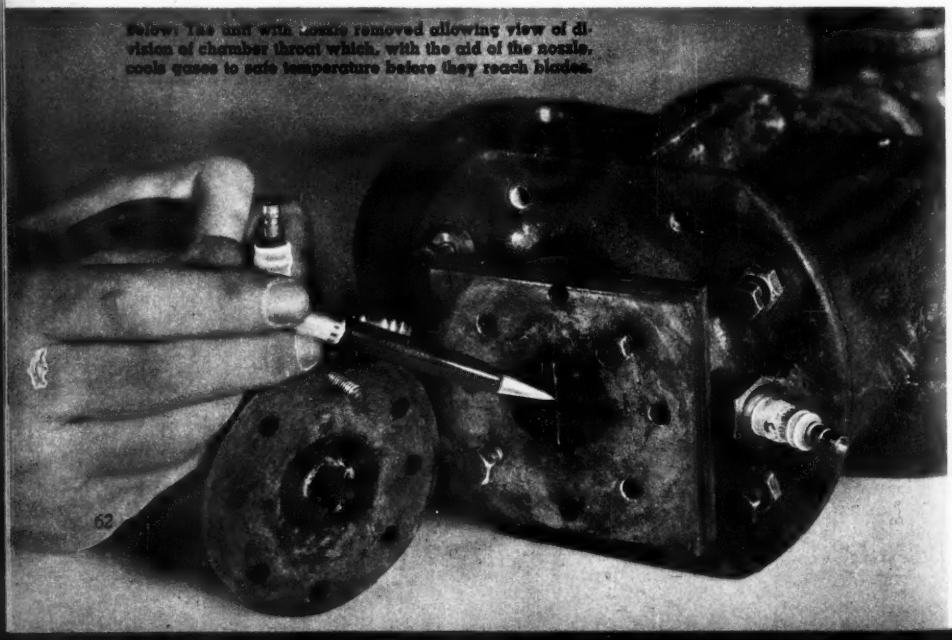
For use as the motor of an automobile, Kafka pictures four jet units, mounted at equal distances around the front side of a disk about the size of an ordinary flywheel. The thrust of these jets would spin the disk with a pinwheel action.

Sufficient power could be generated in this way, he says, but the wheel would have to turn at very high velocity, requiring reduction gears. So Kafka does not stop at this point. He carries the nozzle ends of the jet units through the disk, and here they discharge against turbine blades. Thus he gets a combination of straight jet power and gas-turbine power.

It is in such a set-up that he visualizes an automobile power unit of efficiency far surpassing any internal combustion motor. Forty to fifty miles-per-gallon on kerosene is a very conservative estimate, he thinks. He has used gasoline in his experimental models, but says a lower grade fuel would suffice, as in other gas turbines.

Starting the Kafka jet is a simple matter. All that is required is a small blower that can be operated from the car's battery. A spark plug in the nozzle gives the initial explosion, and then the two firing chambers take over.

Henry C. Carney, president of Carney Associates, has great confidence in Kafka's invention. He took the young engineer under his wing over a year ago after a thorough study of the working model.



Below: The unit with nozzle removed allowing view of division of chamber throat which, with the aid of the nozzle, cools gases to safe temperature before they reach blades.

Eerie Flight was "Slick" Goodlin's description of his 19 minutes in the XS-1. He and the plane, above, were dropped from the belly of a B-29 at 27,000 feet. Once, to feel it out, he shot the XS-1 up to 550 mph. This summer he'll try to crash the sonic barrier. He predicts 1,000 mph. (See Bell's XS-1, MI, Oct. '46.)

3,000,000 Watt commutator built to supply direct current for a steel mill gets its teeth tightened at left by a workman in the Westinghouse shops where it was built. Carbon brushes rubbing against the hub directly behind the man's head will collect the electricity.

Winged Auto speeds past the cameraman at 90-mph in tests for tire endurance on a dry lake near Lancaster, Calif. The rudder counter-balances centrifugal force on curves. High speeds simulating highway driving are thus obtained on a circular track.

Participant registers her likes, dislikes and indifference to the show by pushing the lever forward, backward or leaving it in neutral.

Approval Meter

BY SAMUEL KAUFMAN

WITH the "approval meter," program directors will no longer have to rely on laughter, applause or boos to learn just what the audience thinks of entertainment.

The method—developed by Schwerin Research Corporation—works automatically and records reaction for study later. All you do is push or pull a tiny lever at your side.

At present, tests involve the assembling of two groups of 300 listeners in a Radio City studio each week. Recordings of past programs (or transcriptions of auditioned programs) are played back. During each program segment, a number is flashed on a screen and the participants vote on whether they like, or dislike or are indifferent to the program at that point.

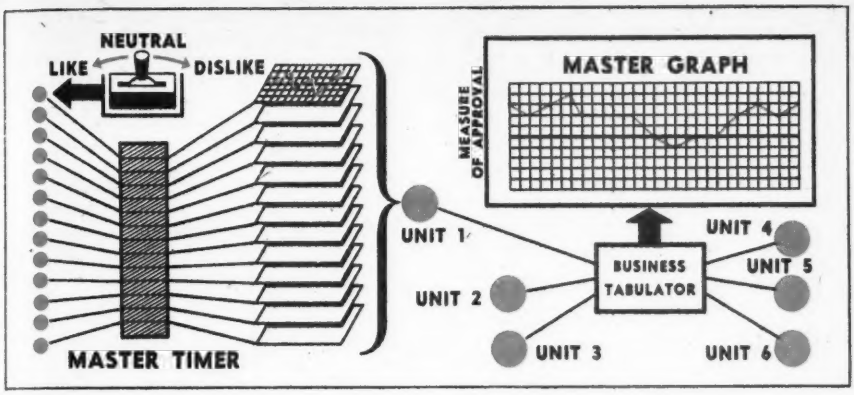
The approval meter instantly records each participant's responses on an individual card. A tiny control lever on the right arm of each studio seat is manipulated to punch a card which is later filed and tabulated automatically by an office machine. When the listener pushes the lever forward, he approves of the program. When the lever is moved back, he registers disapproval. And when it is kept in neutral position, it shows the indifference of the listener at that point.

The control lever, mounted on top of a small flat box attached to the seat arms, is a single-pole type of throw-switch similar to that used on small telephone switchboards. Placed conveniently for constant manipulation by the participant, the lever controls signal impulses which are relayed either to the stage or a backstage room where the participant's likes and dislikes are recorded.

A master timing device linked to each lever control box permits a hole to be punched at every 12-second interval. This time-unit, however, is arbitrary, and can be adjusted to any desired length.

A graph chart is set up later for program directors, advertising agency men and other parties interested in the survey re-

As the program is played back, Horace Schwerin —who developed the system—shows program directors what the approval meter recorded.



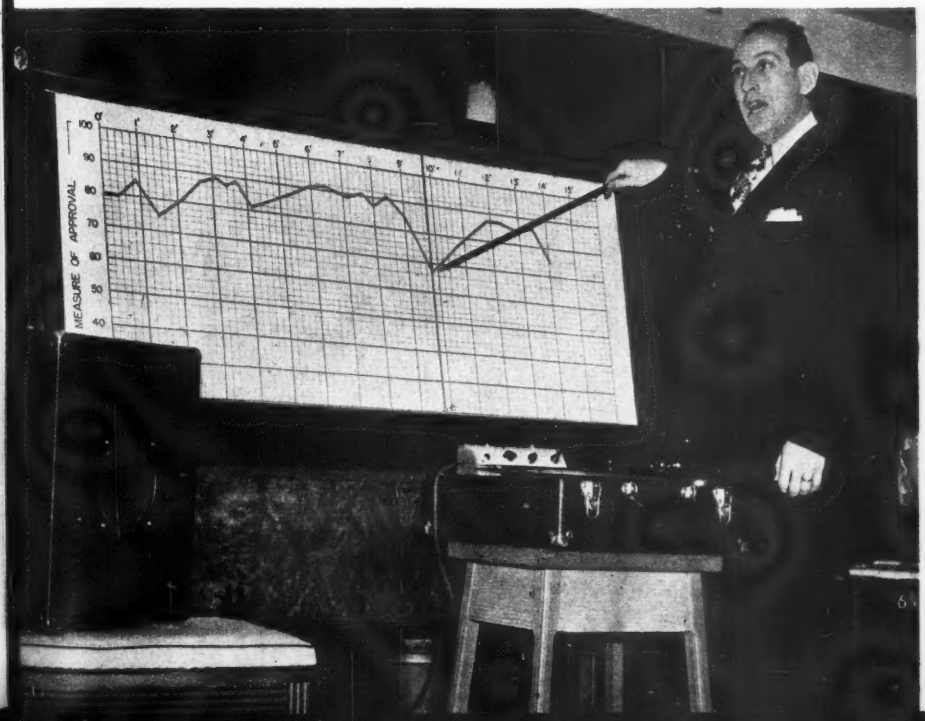
sults. The chart is marked off, left to right, in numerals designating minutes. Then, the same recording voted on by the test audience is played back.

Careful selection and pairing of turntable and chart motors assure adequate synchronization. Variations between the turntable speed and the mechanical pointer's rate of motion have been so slight as to be considered negligible. However, Schwerin's engineers are prepared to employ a common motor for both the turntable and the chart should any synchronization difficulties arise.

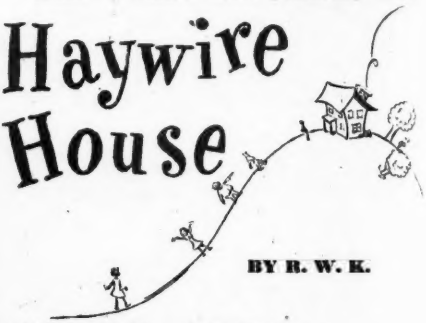
Consumer polls are being used today in virtually every industry to determine the opinions of the public on various products and commercial services. Inventive genius has contributed much to the successful handling of such "sampling" polls, much of the work being done by mechanical and electronic means.

Customary office equipment such as telephones, typewriters, calculating machines and dictaphones have been used in such polls for a long time. But Schwerin's is the first device especially designed for the efficient registering and exhibiting of public preferences.

Although the approval meter shown here was primarily designed for radio, the method is applicable to any entertainment.



Haywire House

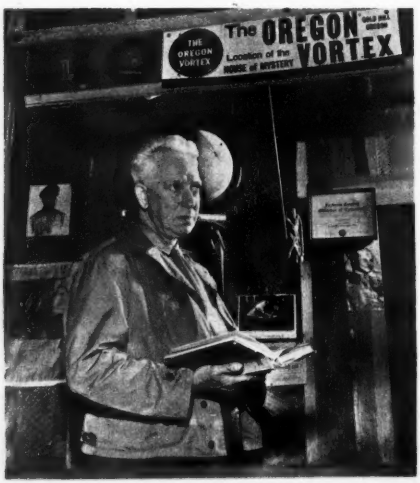


BY R. W. K.

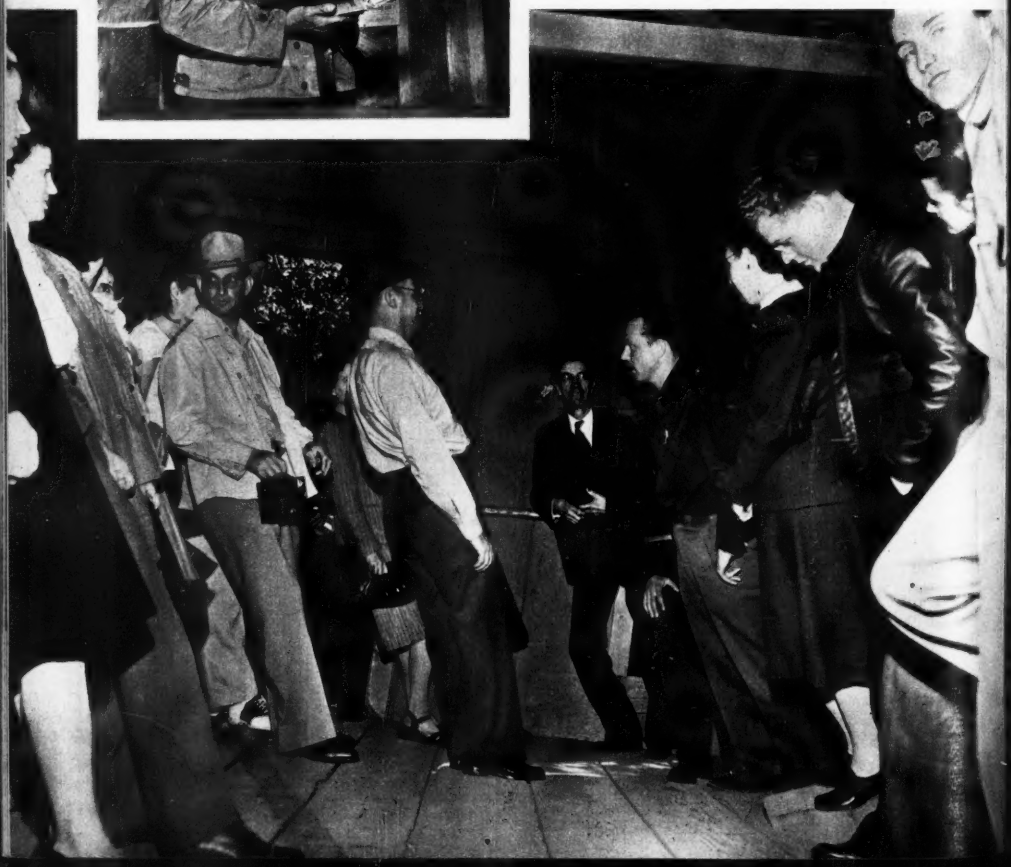
I'VE been there, I've seen, I've taken pictures—but I still don't see how such things are possible.

The Editors of MI heard some wild stories about a place called the House of Mystery. What stories! People go around ten degrees off the vertical! A golf ball thrown straight up comes down several inches to one side! A bottle rolls uphill! A broom stands by itself—at an angle to the floor! People grow taller or shorter, depending on where they stand! All this happens in Oregon, in a peculiar area called the Oregon Vortex, a circle, or rather a sphere, exactly 165 feet 4½ inches in diameter up in the Gold Hill country!

The Editors, always hot after new science angles but suspecting trickery, arranged that I be sent up after the story. Right off, I'd better say I'm not a trained scientific writer at all, but a photographer. I got the assignment because I wasn't born yesterday and



John Litster, Man of the Vortex—and scene in his House of Mystery.



It's easy as pie for Madelyn to pull the 28-lb. weight to her right, but very difficult to push it to her left! And below, we find the plumb line isn't plumb! Or else Madelyn isn't plumb.

because I know my camera angles. They figured if there was any optical trickery involved I'd catch it.

I'll say right here that the House of Mystery is still a house of mystery to me.

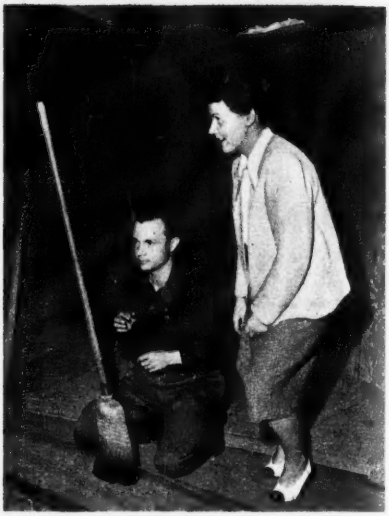
I was plenty skeptical when I arrived. Right away John Litster, owner of the works, looked me in the eye. "Keep alert here," he warned. "You'll need all your skill. I won't promise that your pictures will come out. You may have to come back several times."

I certainly tried to be alert.

First he took me to a place where there were two concrete blocks a couple of feet apart, separated by a line. The line, he said, marked the edge of the Vortex, one block being outside and one in. He stood me on one block and himself stood on the other.

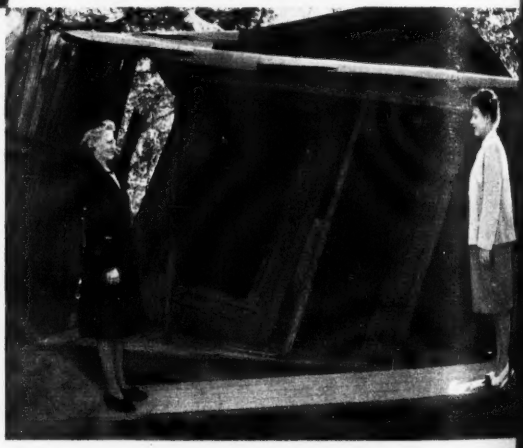
"Now, sight along a line level with your eyes and see what part of my face comes into view," he directed. I did it, and found myself looking at the top of his head. I was the taller one.

"Now let's swap positions," he said. We did that—and now I found myself looking squarely into his eyes! I couldn't help myself! I was amazed! *He* was taller! I tried it again. I experimented. The concrete blocks were level and even with each other in the ground!



Photos by R. W. K., Graphic House

Why, here's Madelyn, shorter of the two, above, but grown wonderfully, right! And look at that gravity-disrespectful broom!



While I was trying to fathom the secret, a dozen tourists gathered to be taken through the House, and I joined them. As we stood outside the Screwy Circle, Litster told us to cross over carefully, then stop and stand perfectly still, and we'd actually feel the change of balance. We did it. He was right! It were as though a strong wind were blowing us over toward magnetic north! We were to remain at this odd angle, sometimes greater than 10 degrees, during all our stay.

After this we were led through a rickety gate in a high board fence, and inside found ourselves in a small yard flanked on one side by the House of Mystery itself, left just as it had fallen during an earth slide many years ago. The crooked doorway captured our eyes. One elderly woman, livid with fear, refused to go a step farther.

At the doorway our guide told us to watch our balance carefully when entering because we could very easily fall *up!* At this advice a few ladies giggled and one old gent smiled and expertly arced a gob of tobacco juice between two rotting boards. But when we filed in we found he spoke the truth! The floor was at an angle, and standing was made difficult by the pull of some mysterious force!

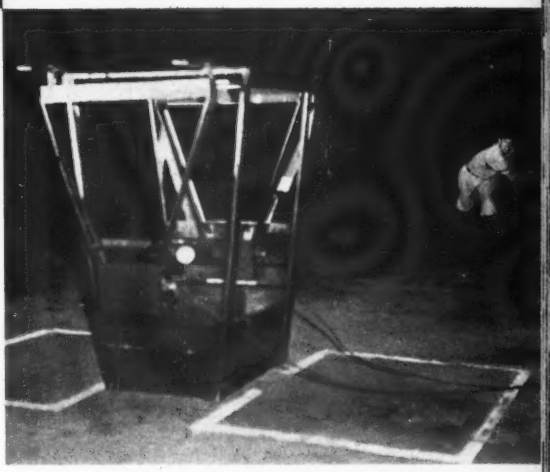
In the House the experiments began. A girl was told to push a 28-pound weight, suspended from the ceiling, in a certain direction. She did it with ease. But when she tried to push it the opposite way it took all her strength! A golf ball tossed straight up fell inches to one side! These aberrations were due to the magnetic pull of the vortex of electrons, according to Litster, who says the House of Mystery puzzle is based on the same principle as a vortex.

I looked up that word "vortex" as soon as I got back, and I guess I'd better put down what the dictionary says. [*Continued on page* 88]

Hangover Heaven is the apt name of the unusual bonnet at right. Originally developed by makeup man Max Factor for the benefit of actresses who wish to refresh their faces on hot studio sets without spoiling their makeup, the facial ice pack was quickly diverted to another purpose by festive Hollywoodians. The headpiece, adorned with water-filled plastic cubes, is kept in the refrigerator while the water freezes.

98.6 MPH Pitch and a new world's record, was made below by Bob Feller, Cleveland Indian hurler at Griffith Stadium, Washington, D. C. The measuring instrument is an Army chronograph, used chiefly to test the speed of bullets. The baseball's speed of 145 feet-per-second means that the batter would have had only a little over a third of a second to figure out just where to smack. The former record for speed was made by Atley Donald.

No Arms and yet he enjoys the sport of bowling and even hung up a score of 96 at duckpins on his very first try in a Washington, D. C., bowling alley. The ingenious device is the invention of Harold A. Carlson, 45, who lost both arms as a youth in a railroad accident. He is shown above all set to swing a duck ball down the lane for a strike. A rubber suction cup, attached to his arm prothesis, holds the ball. At the proper part of the swing, a trip device lets the ball go. Carlson says that all parts for the invention were bought at variety and bicycle stores.



Doll Sculptor

THEY'RE not just playthings but reflections of real life. Bernard Ravca has been sculpting dolls for 22 years. His details are correct, for in his wide travels he has gained an accurate knowledge of many people's customs, costumes and folklore. He uses three different techniques. Cotton dolls are covered with silk then painted and chemically treated. His crumb figures cannot be made in the U. S. because American bread does not crumble. Lastly, he uses a special plastic which he makes himself.

Right: June Mertfeld poses with a pair of Ravca's life-size French peasant figures.

Below: These life-like mites were made from French bread crumbs. Top: "The Gossips."

don't be a FIRE-FOOL!

WHAT do you know about Fires? Do you know the major dangers? Few people do. They are Panic, Burns, Asphyxiation. Panic is the worst.

Panic quickly seizes a person trapped in a burning building, transforms him with hysteria, causes him to act illogically and unsafely at a time when every mental and physical faculty should be used in finding a way out. Panic leaves him an easy prey to Burns or Asphyxiation. These kill.

Remember, Death does not act first in a fire, but Death's pals. Avoid Panic by keeping calm, keeping your reason and your sense of direction, acting methodically to escape. Avoid Burns by remembering that most burns are caused by the clothing catching fire first. Avoid Asphyxiation by not inhaling any more smoke or bad air than you can help.

On the next two pages is pictured a number of ways in which a fire may start in your home. If faced with any of these fire problems, what would you do?

You'll find the answers written upside down next to the questions. Study each picture and caption carefully before checking with the answer. Any you find you don't know, LEARN. (Photos by courtesy of Watch, published by American Mutual Liability Insurance Co.)

1. **It is 10:30 p.m. and the family wishes to retire. A fire still burns brightly in the fireplace. What should be done about the fire?**

A metal screen should be put in place so that no sparks can escape. (End of use of fire should be anticipated and fire allowed to burn down before retiring.)

2. **A portable heater ignites a curtain blowing from a partly-opened window which in turn ignites bed clothing. What are the first two things to be done?**

1. Close window and bedroom door. 2. Call fire department. 3. Use fire extinguisher. Preventive: Do not leave an open-type portable heater unattended.

3. **A frying pan containing hot grease suddenly blazes up on the cook-stove. What is the best way to put out the blaze?**

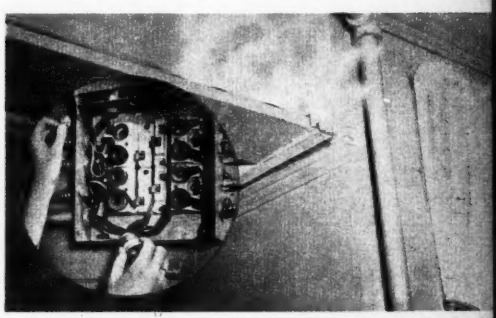
Maneuver a pot cover or other non-combustible object into position over the pan, to tightly close it, and smother the flame.

4. **You awaken at night to find your bedroom filled with smoke. You are near suffocation. What should you do to escape?**

To escape from a smoke-filled room or house it is safest to CRAWL to an exit, keeping the head as near to the floor as possible. The purest air is near the floor.

5. **You discover a fire under the basement stairs caused by oily rags. How can it be put out? What preventive measure should you have taken to prevent the fire?**

Prod rags into open space with broom handle, then smother flames with sand, dirt, rug or heavy blanket. Preventive: Keep oily rags in a tightly-covered metal container.



6. **Smoke comes from a "mystery blaze" inside the walls of your home. Firemen find a penny in the basement electric fuse box. What vital lesson does this teach?**

A fuse is a safety valve which protects against short circuit or overload. To substitute an oversize fuse or a penny jams the safety valve. Fire may result.

7. **The sparks from the trash burner in your back yard set fire to a neighbor's house. What should have been done to prevent this?**

8. **Smoke is seen escaping from a point where the furnace smoke-pipe joins the chimney. What is this likely to indicate?**

9. **What is the principal fire hazard in this picture? Are there others?**

A fuse is a safety valve which protects

Prod rags into open space with broom handle, then smother flames with sand, dirt.

To escape from a smoke-filled room or house it is safest to CRAWL to an exit, keeping the head as near to the floor as possible. The

7. The sparks from the trash burner in your back yard set fire to a neighbor's house. What should have been done to prevent this?

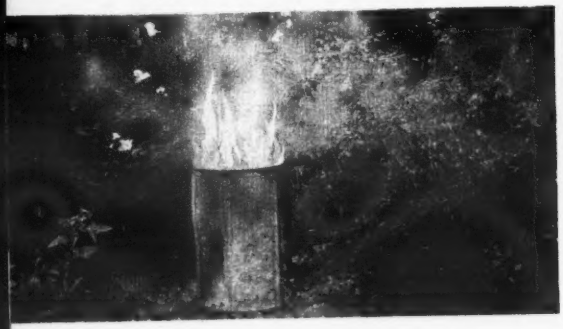
This makeshift trash burner should be replaced by a wire-mesh or other type basket which confines the burning embers and sparks.

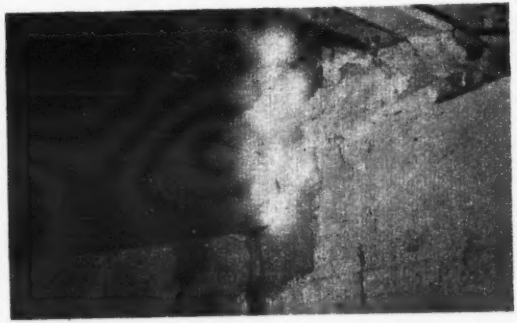
8. Smoke is seen escaping from a point where the furnace smoke-pipe joins the chimney. What is this likely to indicate?

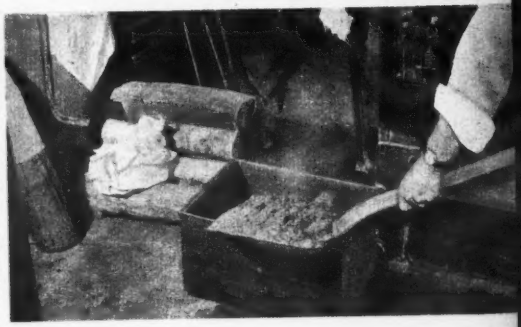
The chimney probably needs cleaning or oil-burner needs adjustment. Such leaks should be stopped to maintain the draft essential to the operation of your furnace.

9. What is the principal fire hazard in this picture? Are there others?

Hot ashes should always be placed in a metal container.







10. Two types of matches may be purchased for household purposes. Which type should be used? Why?

Safety matches are much safer for household use.

11. You are cleaning and pressing a dress when the phone rings. What should you have done before answering it? What additional fire hazard is seen in this picture?

You should have turned off the electric current and removed the iron from combustible material. You may be gone longer than you think. Naphtha should never be used.

12. What important fire safety measure is this housewife violating?

Falling asleep while smoking in bed or on a divan is a leading cause of home fires. Each year hundreds do this and lose their homes---if not their lives.

A FEW weeks after the Japs launched their historic sneak attack, a medium-sized American submarine moved out of Pearl Harbor, sailed all the way to Tokyo Bay, shot up shore installations and torpedoed ships for six weeks off the Japanese coast, and then made the long 4,000-mile trip back to Pearl Harbor—all without stopping once to refuel or replenish its ammunition supplies.

This record-breaking "non-stop" trip was made possible by just one new simple machine—the Kleinschmidt compression still—a small, compact device for distilling fresh drinking water from sea water. In place of the large stores of fresh water the submarine formerly had to carry, it was able to bring along enough extra supplies of fuel and ammunition to greatly increase its fighting power and to more than double its former cruising range. Since then, practically every fighting ship put into the water by the U. S. Navy has been equipped with one of these amazing devices.

What this still has done for our fighting ships, it promises to do for every peacetime ship afloat—for the greatest ocean liners, for the smallest privately-owned boats. Moreover, because of its incredible fuel economy, it promises to be of high commercial value in the distillation of alcohol, the production of evaporated milk and maple syrup, and similar evaporation processes on land.

The Kleinschmidt still is something of a marvel in the way of efficient fuel utilization. Irrespective of its various sizes and the many conditions under which it has had to work, it has demonstrated that with only a single pound of fuel it can consistently produce as much as 175 pounds of fresh drinking water. Compared to the modern vacuum type of still, this is an increase of approximately 400 percent in fuel efficiency; compared to the conventional still the increase is 1,500 percent. The secret of this extraordinary efficiency lies in a comparatively simple mechanical principle. In the ordinary still, the heat used to convert the liquid into a vapor is completely dissipated when the vapor cools down to a liquid again. In the Kleinschmidt still the heat in the vapor is reclaimed and used to boil the raw water that is continuously being fed in.

As can be seen from the drawing, the still is first filled to about two-thirds of its maximum capacity with sea water. If the still is electrically driven the salt water is brought to a boil by means of an electrical heater; if it is gasoline-engine driven the water is brought to a boil by first being put through the exhaust manifold, which has been allowed to get hot. Once steam is produced it is conveyed to the compressor, which puts it under a pressure of three pounds per square inch, raising its temperature ten degrees, or to about 222 degrees. On leaving the compressor the superheated steam passes through a series of vertical metal pipes, arranged somewhat in the form of an ordinary house radiator and completely immersed in the salt water. Passing through these pipes at a temperature of 222 degrees, the superheated steam boils the salt water that is continuously being fed into the still. In other words, once the original volume of water is brought to a boil, the still from there on develops enough heat right within itself to eliminate further need of applied heat.

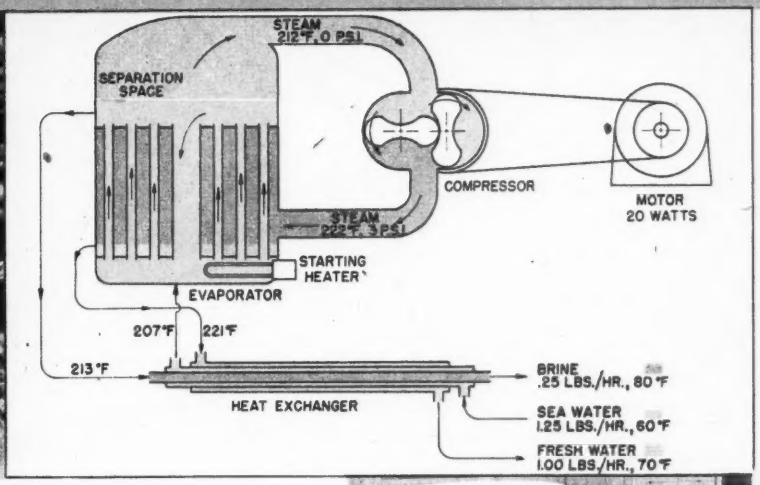
Field stills like this, used by Marines in invasion of Saipan, greatly simplified the water-supply problem.

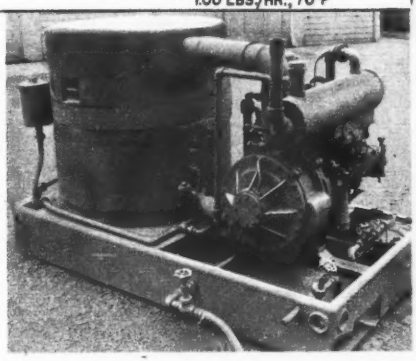
The key of the whole process lies in the physical fact that steam has the ability when placed under pressure to condense back to water at a temperature higher than 212 degrees. What the still does is create a 222-degree steam which is hot enough to turn water into steam, and yet which, because of its being pressurized, is itself cool enough to condense back to water.

In condensing, the steam gradually accumulates as water in the bottom of the connected vertical pipes and eventually flows out one side of the still. The salt

fresh-water still

Simply, efficiently, much salt water becomes much fresh water.





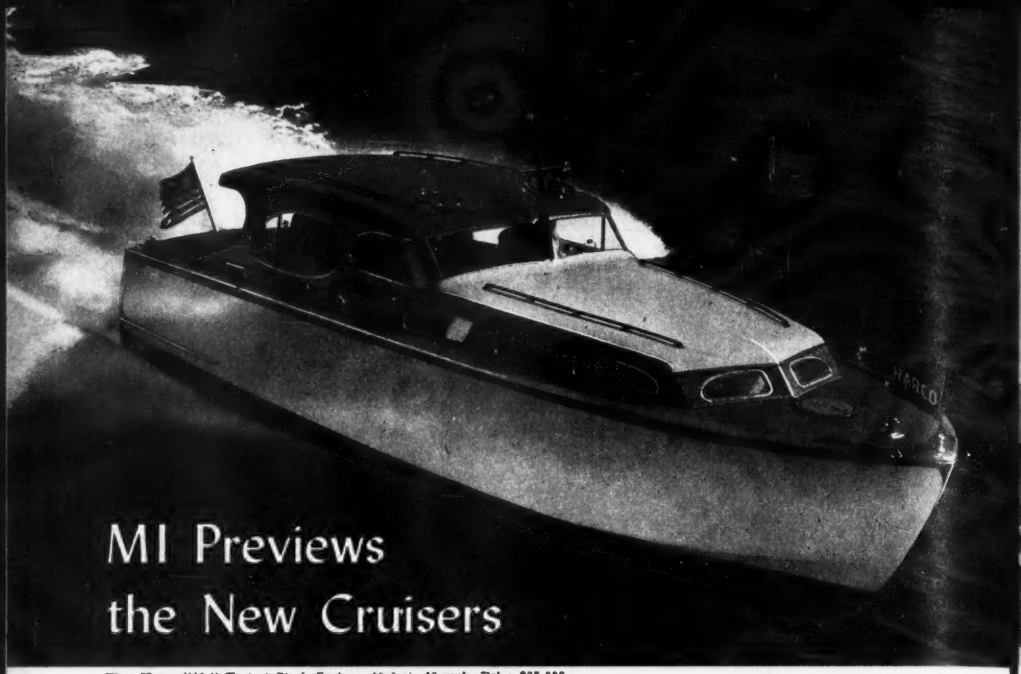
Right, recent gas-driven model producing 1800 gallons of water a day. Explanation of diagram is in text.

concentrate, or brine, in the boiling water rises to the top and is there automatically skimmed off by requiring it to continuously overflow into a waste pipe.

One of the unusual features of the still is that a certain circulation of water is maintained right within the boiling chamber. In passing through the vertical metal pipes immersed in the water of the chamber, the steam first adds heat to the water lying closest to the pipes, giving it a tendency to rise, as indicated by the upward pointing arrows between the vertical tubes, while the other cooler water in the chamber tends to drop to the bottom of the chamber, as indicated by the curved downward pointing arrow. As a result of this circulation the raw water entering the bottom of the chamber has a tendency to flow immediately between the hot vertical pipes and thus be more speedily brought to a boil.

To assist the superheated steam in bringing the inflowing raw water up to 212 degrees, the still makes use of a preliminary heating device called a "heat exchanger." This exchanger consists simply of three pipes placed one inside the other in concentric fashion. Through the innermost pipe moves the outflowing waste brine at an initial temperature of about 213 degrees; through the outermost pipe moves the outflowing fresh drinking water at an initial temperature of about 221 degrees; and through the third pipe, which lies between the other two, moves the inflowing sea water. On entering this pipe, the sea water may be at a temperature of only 60 degrees, yet by the time it has passed through the heat exchanger and picked up heat from the hot outflowing brine and drinking water, it enters the still at a temperature of about 207 degrees, only five below the 212.

For every pound and a quarter of salt water introduced, the Kleinschmidt still discards a quarter pound of brine and yields a pound of fresh drinking water. In the operation of, say, a 1,000-gallon-a-day electrically-powered still, the production of each pound of drinking water requires approximately 20 watt-hours, or an energy input of 68 British Thermal Units, as opposed to 300 watt-hours, or 1020 BTU's, in [*Continued on page* 168]



MI Previews the New Cruisers

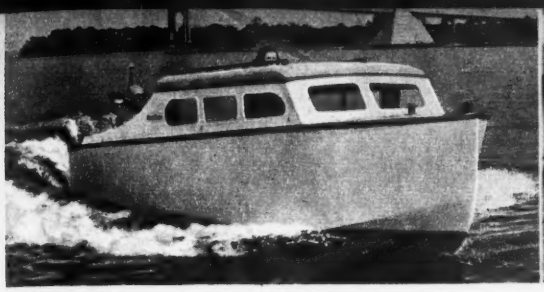
The Harco "40," Fastest Stock Cruiser, 40 feet, 40 mph. Price $25,000.

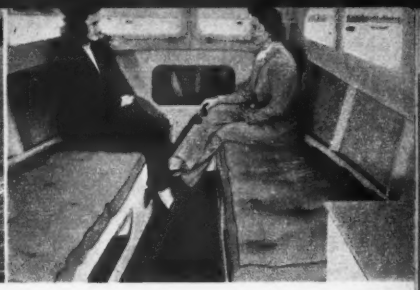
Step aboard the 1947 Fleet with MI's Boating Editor and get the inside story on the latest in boats.

WITH an estimated 1,000,000 motor boats afloat by this summer, America's boat builders are shifting into high in an all-out production race that is part of the greatest boom in recreational boating this country has ever seen. Everything from pint-sized aluminum outboard speedsters to sea-going "dream boats" complete with air-conditioned lounges and chromium bars are being produced in quantities undreamed of ten years ago. While it's true that before Pearl Harbor a few builders such as Chris-Craft, Elco and Owens were in reasonably large-scale production, far too many of the other companies in the field were using antiquated building methods. Faced with the wartime necessity of producing the huge fleet of small craft required by the armed forces, the normally conservative industry was practically forced to adopt modern assembly line methods. As a result, the builders today are equipped to turn out more boats than ever before to meet the unprecedented demand for almost anything that will float.

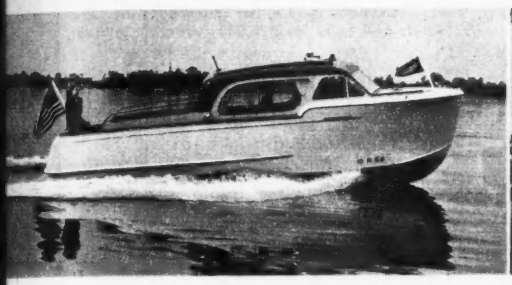
Of all the new pleasure craft coming off production lines this spring, the stock cruisers are by far the most outstanding examples of the latest trends in design, construction and performance in the marine field. Not only are the new boats better looking but they're faster and by making full use of waterproof plywood, new plastics and lightweight metals, the builders have packed a world of comfort and convenience below decks. That "black hole of Calcutta," the forward cabin, is now a light, well-ventilated stateroom that's tastefully furnished and decorated. Top sides, you'll find wide, roomy cockpits for loafing or fishing, larger deck houses almost surrounded by glass and forward decks where you no longer have to be an acrobat to handle ground tackle or do a bit of sunbathing.

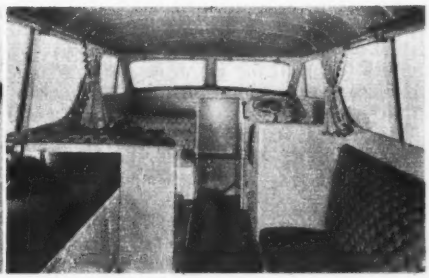
Now, let's assume that you're already sold on the idea of spending your summers afloat and are definitely in the market for a new boat. Obvious in these few pages it would be impossible to report on every one of the new stock cruisers coming down the ways this year. What I have done is to go aboard as many of the 1947 boats as possible and give them a careful inspection both above and below decks. On the basis of design, construction and livability of accommodations, I have selected ten of the cruisers and presented the features of each along with their faults, if any. In price, the boats selected range from about $2,200 for the 20 ft.





"Cruis-Along" by M. M. Davis & Son, a 20-footer that has living facilities for two, a speed of 14 miles and sells for $2,200. Interior view at right shows berths and part of galley. Lots of light and air here.





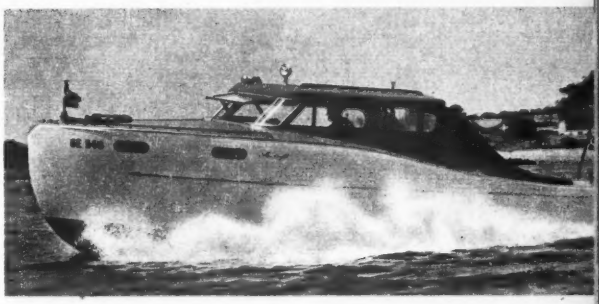
Richardson's 23 ft. Sedan Cruiser. Dinette in modern interior to right forms double berth. Price $5,500.

BY WILLIAM E. DUGGAN,

Cruis-Along to somewhere in the neighborhood of $50,000 (or more) for the 60 ft. *Blue Swan,* a custom-built job that was only included as an example of a "dream boat."

Now let's get down to cases and step aboard the smallest of the fleet, the "Cruis-Along" built by M. M. Davis and Son at Solomon, Md. This 20-footer offers full cruising facilities for two, plus a good-sized cockpit and top speed of about 14 miles an hour—all for $2,200. The cabin with "sitting headroom" has more air and light than many boats twice her length. On the debit side, I found the framing of the plywood hull too light for anything but protected water cruising and the square lines of the cabin top give the boat a slightly box-like appearance forward.

If you want a few more feet of boat and are willing to raise the ante on price to $3,500, you can't beat the 26 ft. "Steelcraft" for value. Churchward & Co. of West Haven, Conn., the builders, have combined low cost manufacturing methods and mass production to give you more for your money than any other

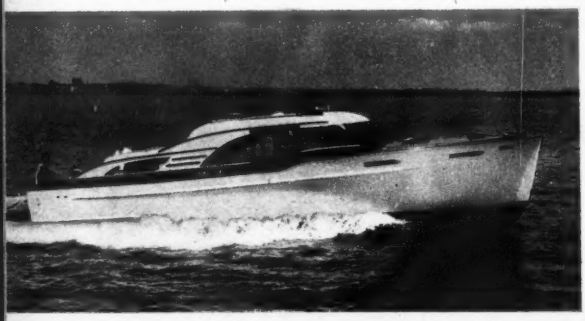


Above: "Steelcraft," 26 ft. of cruising value for $3,500. Below: "Blue Swan," Consolidated's 60 ft. "dream boat"—at $50,000.

Elco "Cruisette," a 35 footer that sleeps six, does 21 mph and sells for $15,000. Interior to right.

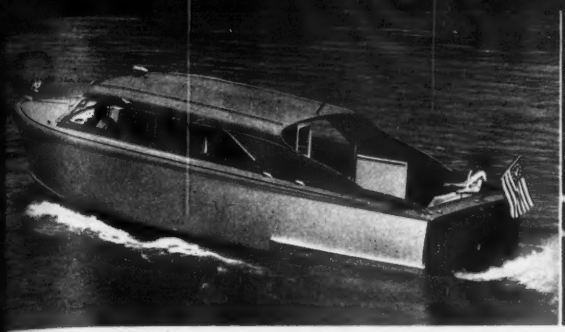
cruiser afloat today. The hull is welded steel and in the sedan model illustrated, offers full cruising comforts for four, an enclosed sedan cabin plus a roomy cockpit. Powered by a 93 hp. Chrysler Ace, "Steelcraft" has about a 17-mile top speed. Along with the good points, this boat also has a few bad ones. She has a tendency to be rather wet in rough weather (due to the lack of reverse sheer in the hull), the finish below decks and furnishings just about get by and the lack of insulation under the cabin top should make it an oven in hot weather.

Moving a little higher in the price scale to the $5,500 class, there's the Richardson 23 ft. Sedan Cruiser, a fast job for the man who wants to do his cruising in a hurry. With speeds up to 33 miles per hour, the Richardson, built at North Tonawanda, N. Y., is the first molded plywood cruiser to reach the market. Eight pre-molded mahogany sections are assembled over oak frames to give a permanently watertight hull with beautiful lines. The interior furnishings are equally attractive with soft pastel colors and modern fabrics. All sleeping accommodations are in the sedan, with two berths in a convertible dinette and another pair in the lounge aft. My objections to this boat are the handkerchief-sized forward deck and the low cockpit coamings which at high speeds would make it difficult to stay aboard. The crowded steering position is another detail that could stand improvement.



Top: Owens' 42 ft. 3-cabin "Flagship," cruises 7, has owner's cabin and bath, large deck house: Price $17,000. Bottom, left: Galley of 33 ft. Wheeler "Sunlounge" showing new portlighting strip. Sleeping six, boat sells at $13,000.

Down in New Orleans, Andrew Higgins and his sons are turning out a line of pleasure boats that are just about the last word in modern design. Their "PT Junior Commando" is a 32 footer that sells for about $10,000 and from the standpoint of functional design and livability, I've never been aboard a boat that can compare with the Higgins. To begin



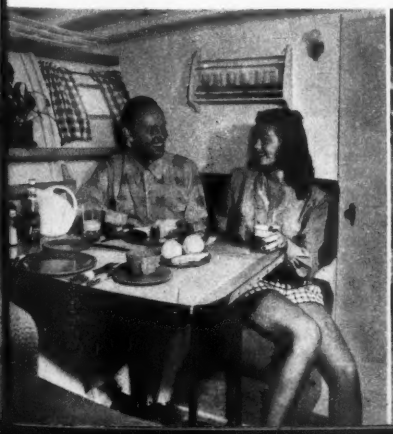
Above: "PT Junior Commando." Higgins 32 footer has 30 mph. speed. Price $10,000. Note open aft end of deck house. Below: 38 ft. Matthews. Conservative design but comfortable and sea-worthy. Cruises six and sells at $14,500.

with, most of the living accommodations are up where there's an abundance of sunshine and fresh air instead of being buried below decks. Another feature is the "barn door" at the aft end of the deck house that opens it up almost completely. With complete accommodations for a party of four she'll travel at a 30-mile clip with a pair of Kermaths under the cockpit floor. Her disadvantages as I see them, are the rounded decks at the sheer which may look good but make footing precarious especially on a dark, wet night, and the lack of screening across the door in the house to keep out sea-going bugs that can make life miserable.

When I went aboard Wheeler's 33 ft. "Sunlounge" cruiser at City Island recently, the "Lightenair" feature was the first thing to catch my eye. This is a fancy name for an extended portlighting strip that floods the cabin with light. The "air" part is very much overrated because there are only two small sections of the strip that can be opened. However, it's so revolutionary that you wonder why no one ever thought of it before. Accommodations on the Wheeler boat are luxurious and leave nothing to be desired. She sleeps six in two separate staterooms and the deck house. Depending on the power installation, the boat cruises at speeds from 17 to 23 mph. and the prices begin at $13,000.

Elco at Bayonne, N. J. are one of the oldest builders in the field and their 35 ft. "Cruisette", selling at $15,000 reflects their reputation for fine craftsmanship and excellent design. Their boat provides berths for six, divided between two staterooms below and a lounge in the deck-house which has one of the trickiest built-in buffet and galleys that I've seen. Closed it looks like a fine cabinet, but with the top [*Continued on page* 164]

"Tea For Two" aboard Chris-Craft's 46 ft. cruiser largest stock job, room for 9 at a price of $25,000.



you cannot tell a lie

BY WALLACE W. ASHLEY
and
NATHANIEL K. WERNICK

THE odd thing about the two men is that one is sitting with his back to the other. Except for that, as well as a tangle of wires linking several box-like objects on the desk, it might be an ordinary business conversation in an ordinary office.

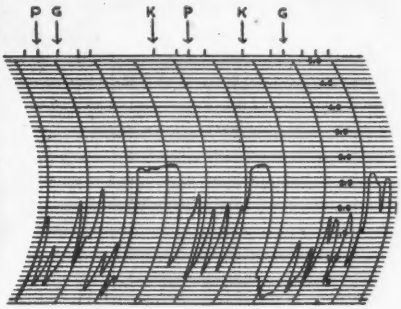
But at once you see that one man is asking questions and the other is answering. You see that the questioner is paying close attention to the electrical equipment in front of him, watching a needle inscribe a wavy line on a moving roll of paper. And, on closer inspection, you see a pair of wires leading from the equipment to the hands of the man who is facing the other way.

By now you realize you are witnessing a lie-detection test. You are in Fordham University's Psychology Department, and the well-dressed man with the quiet, almost toneless voice is Dr. Joseph F. Kubis, associate

Photo above shows the Pathometer instrument setup, with the wires that run to the two hands of the subject.

Left, Dr. Kubis adjusts the simple light-contact electrodes which pick up lies and lay them on the chart.

It is after the questioning, when the chart is explained, that liars crack and confess.



Large graph deflection to question K, "Do you know who took the money?" but small ones to questions P, "Do you have the money?" and G, "Did you take the money?" clearly indicate subject knew about theft but did not take part or share in the proceeds.

professor of psychology. The other man is a suspect in a criminal investigation.

The suspect does not appear unduly agitated. He is not vehement in his denials, although he is insistent that he knows nothing about the murder. And Dr. Kubis seems willing enough to accept his answers as the truth. There is no upbraiding, no grilling, nothing remotely resembling cross-examination.

But a few days later we call on Dr. Kubis again and get the sequel to the test. The suspect was lying throughout, Dr. Kubis tells us. Iron nerves enabled him to hide his agitation—on the surface—but he couldn't fool the lie detector, and Dr. Kubis was able to confront him later with the mechanically accurate and damning record of his falsehoods. The net result, according to a letter from the district attorney which Dr. Kubis shows us with pardonable pride, was a complete confession.

Seasoned criminals have come to have respect for the lie detector, and well they might. Of the two types in general use today one has compiled a record of 75 to 85 percent accuracy and the other rings the bell at 98 percent!

The 85 percenter is the Polygraph, developed by Dr. Leonarde Keeler at Northwestern University. The almost perfect device is the Pathometer, introduced in 1935 by Dr. Walter G. Summers of Fordham. They operate on the same fundamental principle—that telling an untruth creates a situation of conflict within the individual, with attendant emotional disturbance—but there their similarity ends. The Polygraph notes changes in respiration and blood pressure; the Pathometer records variations in the electrical resistance of the skin.

The Pathometer's technique is the seventh and latest to be applied to deception detection in a 40-year period. In it is utilized the known fact that the skin's electrical resistance changes during emotional stress.

As now used, the Pathometer technique consists of recording the electrical variations and interpreting them in the light of the subject's background and the crime or other incidents about which he is being questioned. To record the variations, an electrical current is passed through the subject's body to a two-stage d. c. amplifier and an Esterline-Angus ink-recording milliammeter. A German silver electrode is affixed lightly to the palm of each hand with a bandage or adjustable tape. The current used varies from 1.5 to 22.5 volts, depending upon the electrical resistance of the subject, which can range from 6,000 to 120,000 ohms for various individuals and for the same individual at various times of day. The milliammeter produces a record of the variations in electrical current on a moving roll of paper, and the operator presses a key to mark the paper as each question is asked.

The measured current is proportional to the resistance between the pickup electrodes. Both current and resistance vary as much as 10 percent during major emotional reactions. The variation is only 3 to 5 percent for responses to questions evoking embarrassment or touching upon crime but not involving guilt or guilty knowledge on [*Continued on page* 168]

This is Soaring

BY C. B. COLBY

It's not just a matter of guiding a powered plane through the air—you must learn to *fly on rising air.*

THE difference between gliding and soaring is simply the difference between down and up. It's as simple as that. If the aircraft goes down from the moment the power (tow-line) is released, then you are gliding. If, on the other hand, you hold your altitude or rise above it when cut loose, then you are soaring. Now let's go on from here.

Gliding is old, while soaring is comparatively new. Gliding goes back in fact, to a Benedictine monk, Oliver of Malmesburg, who made the first actual flight of which written record has been found and that seems to be factual. It is recorded that he flew "125 paces, falling and breaking both legs." That seems to be all he did, for it ended his ambitions right there and the only other item we have of this air-minded monk is the date of his death in 1060.

Soaring, the "new" sport of riding the winds, was introduced by Orville Wright in 1911 when he made a soaring flight over one spot of nine minutes and forty-five seconds, while testing an experimental glider.

At present the duration record for single-place motorless craft is 36 hours and 35 minutes, held by the German pilot Schmidt. The distance record is for 465 miles held by the Russian woman pilot Klepikova. The American duration record is 21 hours and 34 minutes held by Cocke. A new American distance record was set last fall when Dick Johnson, carrying a passenger, flew a Schweizer sailplane 314 miles, from Prescott, Ariz., to Governador, New Mex.

How can such records be set entirely without power of some kind? They *are* set with power—the power of air in motion, the power of master aircraft designing and the power of patience. Patience in learning how to *fly*, not just guide a powered machine through the air.

Gliding, the return to earth from a point of release, is as elementary as the fall of a leaf. Soaring is flying at its highest development.

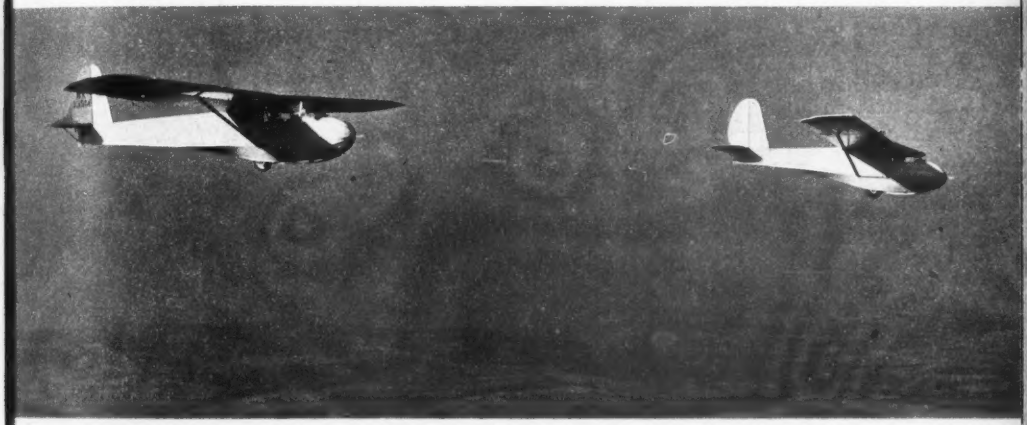
The aircraft used in the art of motorless flight are many and as varied in type and color as the birds they emulate. They come in all sizes, shapes and colors but all have one thing in common—light wing loading (small gross weight carried for the amount of wing area). Upon this wing loading depends their success or failure as soaring aircraft, or sailplanes, as they are called.

Some sailplanes have less wing loading than seagulls so finely have the designers planned the wing load area compared with the minimum or needed gross weight. This fact is the secret behind the ability of the craft to ride upon and rise with the flowing air masses through which they navigate.

To keep aloft, the sailplane must glide forward to provide lift over the wings as in any powered heavier-than-air craft. The flat angle of this forward glide governs the efficiency of the ship as a soaring craft. Some single-place high performance sailplanes have a gliding angle of 33 to 1, which means that for every foot that they sink, they glide forward 33 feet. To bring this point home a bit more strongly take miles instead of feet. If a sailplane is a mile high, only 5,280 feet up, it will be able to land anywhere within a circle 66 miles in diameter, provided it has this 33 to 1 gliding angle and receives no lift during the descent. The average gliding angle of soaring aircraft is about 25 to 1 or roughly two feet-per-second.

While the craft may be gliding down at its sinking speed of two feet-per-second, the air mass through which it is gliding may be rising with a vertical speed of five feet-per-second, so the craft rises at a rate of three feet-per-second every second of its "downward glide." It is therefore, easily seen how the sailplane attains greater altitude than at its release point and may retain it as long as the rising current of air has an ascending speed that is greater than the natural sinking speed of the sailplane.

There are two general methods of soaring available for the average motorless pilot. (Experts have other, trickier ways—see pages 84 and 85.) The first in the amateur class, "slope soaring," is entirely dependent upon the terrain, wind direction and velocity. As air masses move across the country they encounter the slopes of ridges, mountains and plateaus. This air mass (wind) passes up and over these irregularities in the earth's surface, forming areas of rising air along the up-wind slopes of these



Above: Gliders towed by a powered plane —they'll make no attempt to remain aloft.

A "Spyr IV" sailplane, below at left, rides a slope-wind while at right an Army captain hooks on the tow.

ridges. These are known as slope-winds and in this area of rising air along the ridges sailplanes may ride the up-flow as long as they stay before the ridge causing the upward deflection of air. There is one perfect area for the maximum of climb from such a slope-wind. The skill is in finding it, and in staying in it.

Once this area is found the expert pilot will sail along the ridge from one end to the other being careful to keep within the vital area of maximum lift, turn away from the ridge and sail back again. Most endurance flights are made via the technique of sailing the slope-winds.

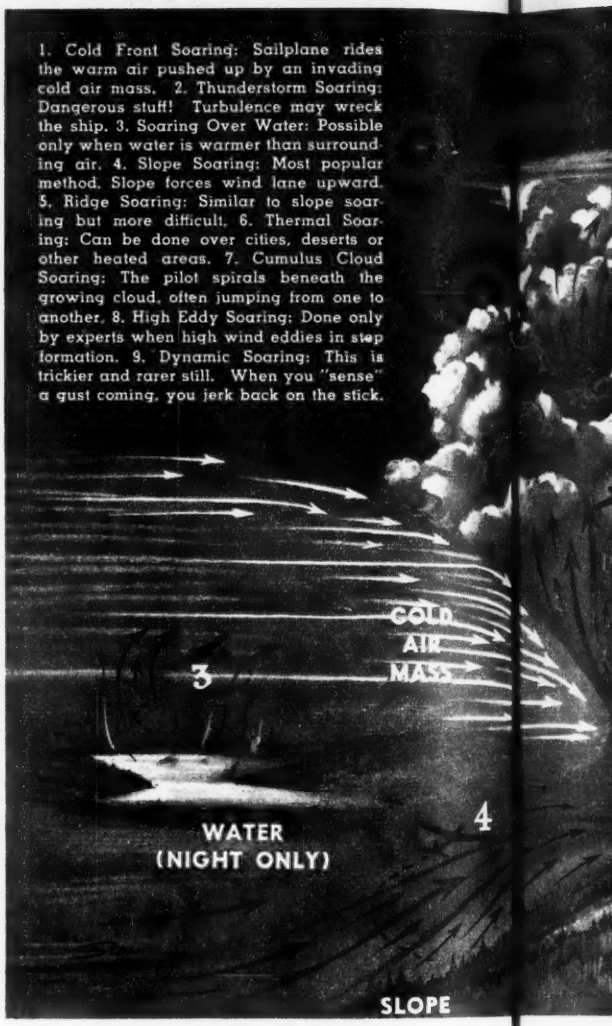
An experienced "ridge-polisher" can attain sufficient altitude over a ridge to sail away cross country to another similar ridge, there regain any altitude lost enroute and continue on to another ridge and so on. In this manner many flights of more than a hundred miles have been made both here and abroad.

The second type of soaring is thermal soaring. This consists of locating a rising column of heated air and circling within it until it reaches a sufficient altitude where it cools and loses its vertical lift. At that point, where the warm air condenses, a cloud usually forms. These cumulus clouds are the sign posts for good soaring pilots who can tell from their shape, size, growth and altitude, where the thermal forming them is located, how good it is for soaring, and whether it is just forming or almost spent. On good days these cumulus clouds dot the sky, forming "cloud streets" as they are called by sailplane pilots.

Thermals are formed by the heating of air to a point where it is hotter (and therefore lighter) than the surrounding air. At that point it begins to rise, cooler air from the sides flows in under it and is heated to follow the previously heated mass. This continues as long as there is sufficient heat under the area to keep the thermal current flowing upwards.

Heat-producing areas may be any surface that will absorb and give off the sun's heat better than the surrounding areas, such as airports, sandy areas, plowed fields, concrete roads, plains, etc.

By combining thermal soaring and slope soaring, the veteran sailplane pilot may zig-zag his way across the country using both types of "lift" to keep aloft. He may start with a slope-



1. Cold Front Soaring: Sailplane rides the warm air pushed up by an invading cold air mass. 2. Thunderstorm Soaring: Dangerous stuff! Turbulence may wreck the ship. 3. Soaring Over Water: Possible only when water is warmer than surrounding air. 4. Slope Soaring: Most popular method. Slope forces wind lane upward. 5. Ridge Soaring: Similar to slope soaring but more difficult. 6. Thermal Soaring: Can be done over cities, deserts or other heated areas. 7. Cumulus Cloud Soaring: The pilot spirals beneath the growing cloud, often jumping from one to another. 8. High Eddy Soaring: Done only by experts when high wind eddies in step formation. 9. Dynamic Soaring: This is trickier and rarer still. When you "sense" a gust coming, you jerk back on the stick.

wind boost, then sail across country until he encounters the "bump" under a cumulus cloud, circle within its rising column of heated air as high as possible, then sail away to another slope-wind or thermal and so on his merry way, for free.

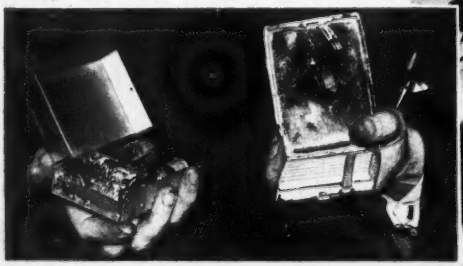
Now in order to take advantage of either slope-wind or thermal the sailplane must be projected into the area of rising air no matter how formed. There are several ways of getting a motorless craft aloft. In the early days of the sport a heavy elastic shock cord was used in the manner of a sort of "king-size" slingshot to get the ships into the air.

The modern methods include such systems as towing the sailplane into the air behind a car speeding along the runway below, using a rapidly spinning winch reeling in a long cable, and towing behind a powered plane.

The first system is limited in the length of cable it can use and the altitude that can be reached due to the limits of the runway for the car doing the towing, although with the controllable speed of the car it is ideal for training and instruction. The height and length of the student's flight, as well as to a certain extent its direction, are controlled from the car.

Midget Car below and load-carrying tricycle at left held the spotlight at a recent vehicle exhibition in Milan, Italy. Light enough to be lifted by two men, the car is said to go 120 miles per gallon. The tricycle is only three and one-half feet high but carries a ton and a half. Its maximum speed is 30-mph and it gives 65 miles to the gallon. The engine size is listed as 125 cc.

Two-way Pocket Radio made during the war by Tele-Radio, Ltd., for British secret service work will soon be on the market. It has a range of one mile with the power-pack shown, but manufacturers say its power can easily be increased. The firm will offer manufacturing rights to interested parties in the United States and Canada. Below, the set is compared in size with a cigarette case.



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Trouble Busters

[*Continued from page* 56]

studied the subject as if it were something new under the sun, as if the conventional hot-dipping steel sheet method did not exist. The real question was, "How can steel be tin plated with the smallest amount of tin?" They came forth with electroplating by induction heating. This method saves from one-third to one-half the amount of tin used in the hot-dipping process.

The president of an office machine manufacturing company went to see the Armour men. One of his machines was too noisy. Two or more of them in the same room made a clatter like hail on a tin roof.

The staff studied the vibrations set up in the machine in relation to the shapes and sizes of its different parts. New sound-absorbing materials and a change in the design of certain parts reduced its overall noise 94 percent.

To walk through the Armour Institute is to see a miniature cross section of American industry. Open that door on the left and you'll see rows of chocolates coming out of an embryo candy factory. Walk to the next room and you'll see cement being made in a model rotary mixer. Up a little farther, just beyond the working flour mill, an enormous smelter melts steel with ultra-short radio waves.

Don't open that door, unless you want to freeze in a temperature of 67 degrees below zero in the teeth of an artificial 200-mile-an-hour gale. It's the thermal chamber, where they turn weather off and on. Just now it's being used to duplicate stratospheric conditions for the testing of equipment. Come back next week and it may be a typical tropical day in there.

The Foundation doesn't limit its research to solving other people's problems. Sometimes it gets curious about how this and this would affect that and that and goes ahead and develops things in its own right.

This is how they perfected wire recording, which allows hours of music to be recorded on a small spool of wire and played over and over without wearing. Five miles of the wire used weighs only a pound, and it can be bent, twisted or even heated to high temperatures without affecting the recording. There is no comparison between this method and the clumsy record system now in use. It is superior in almost every respect.

During the years ahead, the success of our economic system depends in part on whether small companies can compete with the industrial giants. We can reach full employment only if these small companies can keep pace technologically, only if they can win and hold their business in competition with the giants. Scientific research on a fee basis—the Armour system—is the answer.

Haywire House

[*Continued from page* 68]

It was: "1. A mass of fluid, especially of a liquid, having a whirling or circular motion tending to form a cavity or vacuum in the center of the circle, and to draw toward this bodies subject to its action. 2. A supposed collection of particles of very subtle matter endowed with a rapid rotary motion around an axis which was also the axis of a sun or a planet. Descartes attempted to account for the formation of the universe, and the movements of the bodies composing it, by a theory of vortexes."

That same golf ball, put on the floor, began rolling uphill! And it *was* uphill: any customer who doubted that could check it with a level.

A girl, on instructions from the guide, was told to back slowly up into a corner. She did so, but couldn't control her momentum; she suddenly felt herself "fall up," and slammed noisily against the wall!

At one place there were two poles marked off in inches. On one, a man's height would be six feet, say, but on the other, only a few feet away, there would be a difference of an inch, and sometimes more!

A plumb line was suspended from the branch of a tree. Normally the bob and cord would hang straight down—but when we stood in back of it with the bob between our feet, the cord passed nearly in front of one ear!

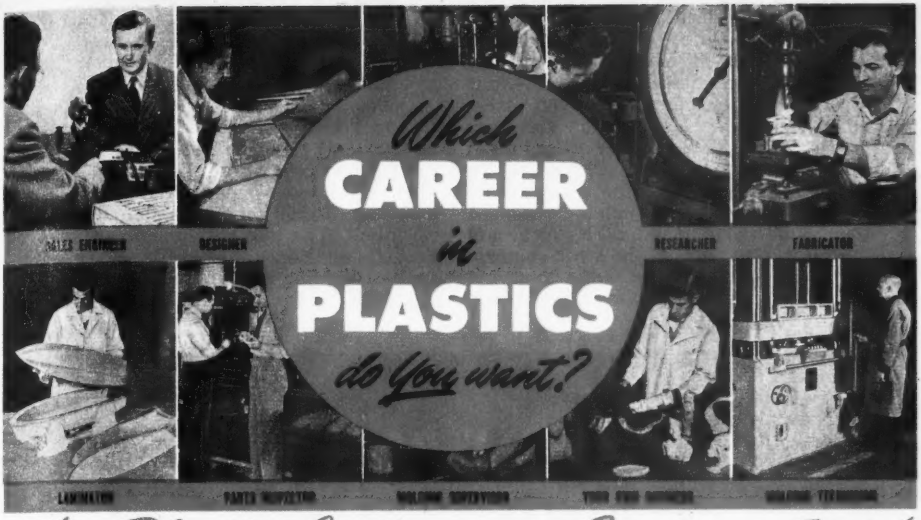
I learned that many years ago the Indians regarded the area of the Vortex as a place of evil spirits. It is said that horses shied when they neared the place. The House of Mystery was erected as an assay office when the white man first came that way in search of gold, and its present owner, John Litster, claims he discovered the oddities of the area some 17 years ago and now stars them in a roadside sideshow to finance his study of the region.

I must say that the place seems a very profitable attraction, and I also must say that Litster was very friendly and cooperative.

These, then, are the highlights of the story. You see the pictures, just as my camera caught them.

To me, the House of Mystery is still a mystery. I'm not enough of a physicist to understand just what this vortex force is. I bought Litster's "Notes and Data" booklet on it, but I bet Einstein himself couldn't make head or tail of that.

The Editors of MI smile whenever I tell how wonderful everything was, and when I ask why, they smile even more—but they won't tell me a thing. Maybe they're putting on an act, but I don't know. I was there. I *saw* these things. What can account for what happens?



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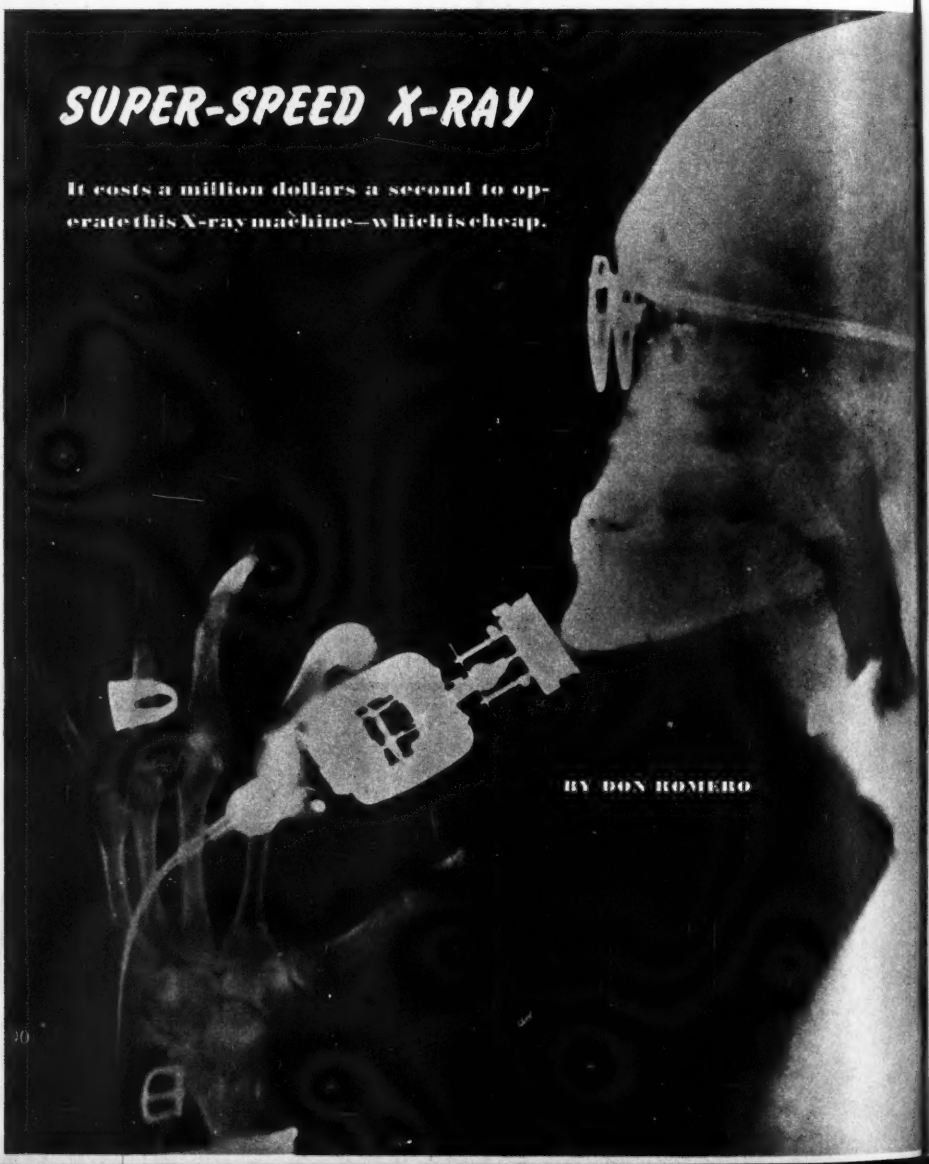
A MACHINE whose operation actually costs $1,000,000 a second may sound like a mad inventor's dream come true, yet few more practical or economical devices have ever appeared in the field of scientific research than the new 360,000-volt ultra-high-speed X-ray machine developed by Dr. Charles M. Slack and his colleagues at the Westinghouse Electric Corporation.

This phenomenal machine is capable of making an exposure at the incredible speed of a millionth of a second, taking clear and accurate photographs of the swiftest-moving objects on earth even while X-raying through as much as a solid inch of steel. What's more, it can make such photographs at a cost of only one dollar—for within the total operating time of a single second, the machine can turn out as many as a million of its amazing X-ray "action shots."

Development of the machine dates back to about 1939, when most of this type of photography required an exposure of anywhere from one to five seconds. Within a year this time was cut to one-millionth of a second—20,000 times faster than a man can blink. The new machine was a steel-penetrating X-ray weapon by which the swiftest-moving machinery or the fastest-flying projectile can, at any desired instant,



SUPER-SPEED X-RAY

It costs a million dollars a second to operate this X-ray machine—which is cheap.

BY DON ROMERO

be photographically shot dead in its tracks.

Within a year after it was completed the machine was conscripted by our armed forces, who lost no time putting it to work on some tough ballistic problems which had our experts pretty well stumped. One of the more important posers which it solved was why certain types of our armor-piercing shells weren't getting through enemy armor. By taking a few side-view shots of these projectiles as they sped down the barrel of a gun, the machine soon showed that the armor-piercing tips of the projectiles were very often becoming detached from the shells even before the shells had a chance to leave the muzzle of the gun. Other photo series revealed other defects.

Another vital war job performed by the machine was in revealing needed facts on the fragmentation pattern of bombs.

One of the most interesting details turned up in the fragmentation studies was the extraordinary damage that a tiny fragment can cause even when it passes through only the soft part of a man's body, such as the calf of his leg. By taking pictures of a small fragment whipping through a leg of mutton, it was discovered that during the brief interval the fragment is moving through the flesh it opens a surprisingly large cavity, in much the same manner that a small stone thrown at high speed into a lake will cause the water to splash aside so as to momentarily form a sizeable "hole." It was found that flesh, like the water, quickly "recovers," usually so completely that hardly any appreciable "puncture" is left by the fragment. And totally unexpected was the discovery that, so great is the shock imparted by the fragment, even when it is extremely small, if it is traveling fast enough it can often break the main bone in a man's leg or arm even though it may miss the bone itself by as much as an inch.

An unusual value of the machine is that it has no difficulty penetrating smoke and flame. Because of this, metallurgical technicians expect it to be of great value in the study of arc-welding processes. Up to now, ordinary photography has been of little help because the metal under study was invariably blotted out by the glare and fumes produced by the arc.

In addition to metallurgy are any number of industrial and medical lines in which the machine promises to be of exceptional research value. High up on the list are heretofore impossible "action" studies of all types of metal-encased machinery as well as a wide variety of high-speed electrical appliances. One field in particular in which the machine is expected to be of unusual help is in the analyzing of compression engines. It is the firm belief of Dr. Slack that, by being able to peer through the side of a cylinder while the engine is running at top speed, the machine may very conceivably reveal extremely vital details on valve distortion and piston strain which up to now have not even been suspected by automotive engineers.

In contrast to the complexity of the work which this machine is capable of performing is the remarkable simplicity of the machine's construction and operation. Essentially it consists of nothing more than six reservoir-like condensers (with spark-gaps and resistors), each of which can be charged to a potential of from 25,000 to 60,000 volts; a transformer and rectifier which are used to charge the condensers; a small control board with comparatively few controls; and a very large electronic tube of special type capable of producing

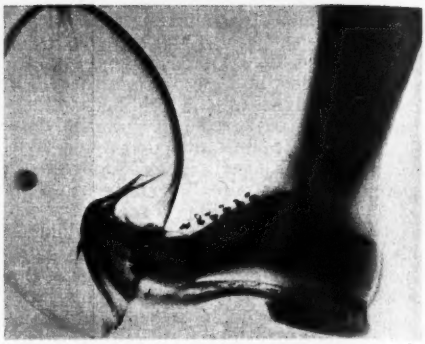
Left. X-ray taken in one millionth of a second by the new ultra-high-speed Westinghouse machine. The tiny motor of the razor was stopped doing 116 revolutions per second.

Scientists look over the "energy factory" that gives millionth-of-a-second exposures. Six reservoir-like condensers accumulate energy for a burst of six hundred million watts.

enough electrons to yield a current of from 1,000 to 2,000 amperes.

In taking a picture of a moving object, such as a speeding bullet, the technician first arranges the gun so that the bullet will move between the electronic tube and the X-ray plate, passing as close to the plate as possible. He then charges the condensers with just the amount of electricity required to photograph the bullet. To set off the electronic tube, he may then resort to any one of a number of activating means: a photoelectric cell setup in which the bullet breaks the light-beam to release the energy from the condensers; a microphone arrangement in which the report of the gun serves as the activator; a circuit-breaking arrangement in which the flying bullet snaps a thin wire to set off the discharge; or a simple mechanical arrangement connecting trigger and condenser.

At present there are about 25 of these machines in the world. Of the dozen or more in this country, about eight are being used by various U. S. Government arsenals. Westinghouse believes that both industry and science will find increasing use for the instrument. For one thing, it can be commercially produced for somewhere around $10,000, which is not much, and for another, because of its simplicity, it can be handled by one man who can be taught all he needs to know about its operation in a week. One feature of the machine is that the only part subject to appreciable wear is the electronic tube. This tube takes such a severe jolt every time a high voltage is thrown at it that its life-span is only about one one-thousandth of a second. Still, this gives a life-span of a thousand photographs.



Foot and football, stopped by the new X-ray tube. The football has not yet started to move forward!

AEROGYPT from BRITAIN

Most unusual feature of the Aerogypt—one of Britain's bids for the personal plane market—is the aerofoil fuselage which adds lift. Small nose propeller drives a generator.

ONE of the most interesting designs for a post war personal plane comes from England and presents many unusual details worthy of study. For example the fuselage of the Aerogypt is of "aerofoil" cross-section, which takes the "dead load" off the wings. Utilizing the same basic principle characteristic of our Burnelli designs in which the fuselage adds its own lift to that of the wings, the Aerogypt claims better performance with less power. The four-place cabin, entered through sedan type doors, seats four people with exceptional comfort and roominess. It is unusually spacious owing to its shape and width, running almost six feet at its widest part. The two engines are 60-hp Continentals and the tricycle landing gear is of the Helmy design. In later models this gear is tentatively planned to be retractable.

Permanent-crease no-wave pants are coming! See how the treated fabric resists water?

No Shrink–

Treated wool fabrics tested in a laboratory laundry wheel don't shrink or mat.

No Spot

A DISTANT cousin of the sulfa drugs, melamine, is being used to "cure" some of the serious "ailments" of textiles.

Its most striking use is in a resin which, applied to woolens, solves the age-old problem of shrinking and matting in water.

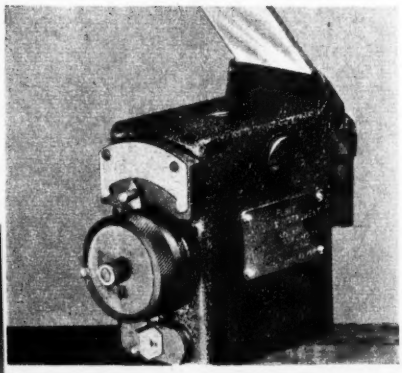
In another form, melamine resins can be used to impregnate acetate rayons and cottons to make them spot resistant. Ink, coffee or other staining liquids, spilled on clothes made from treated fabrics, can be washed off with a damp cloth or a glassful of water.

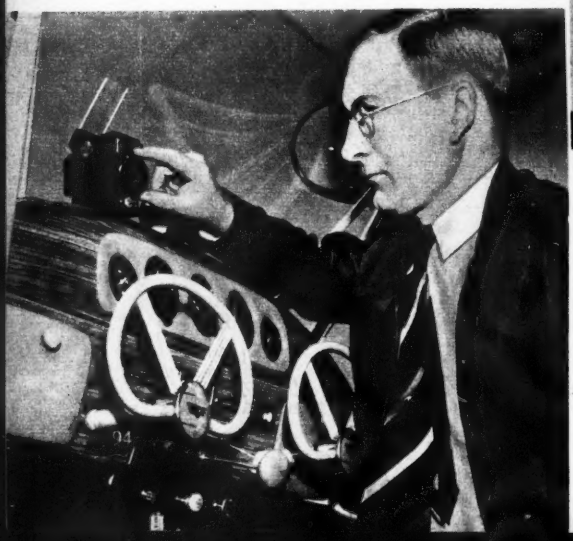
Melamine was first developed in 1834 but was forgotten until a few years ago. It went to war in a resin applied to blankets, sleeping bag linings, socks, and insect netting. But it is in its peacetime application to textiles that melamine promises its widest use.

Any girl who can pour a glass of water can roll a stain right off her dress.

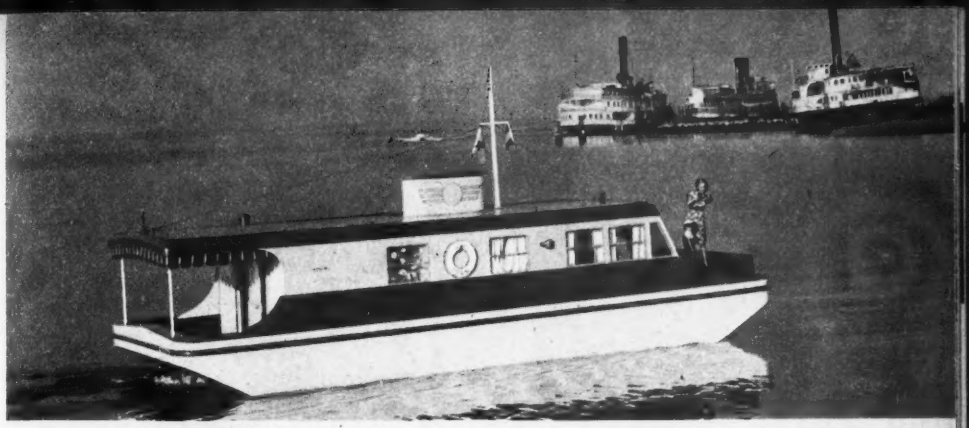
First Signing by television of a legally binding contract was consummated above when executives of the Dumont Television Laboratories in New York and officials of the Chevrolet Motor Company, two hundred miles away in Washington, D. C., put their John Henry's on the dotted line while watching each other in the television screen. This picture was snapped at the New York end. The screen shows what was going on in Washington.

Fascinating Toy with an educational value is this building set invented by Andrew Sommerfeld of Hadley, Salop, England. Using moulds which reproduce sections to scale of famous buildings, youngsters cast the parts in a special concrete strengthened by copper wire. Here they are finishing a church.



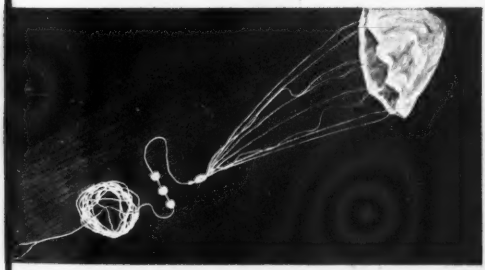


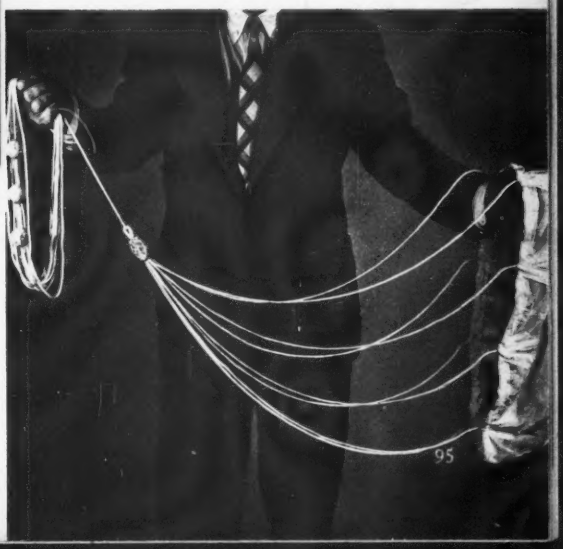
Landing Sight which enables pilots to know exactly when to begin a landing glide is the invention of Earl E. Flint of Middletown, Ohio. An orange dot, projected on the glass by optical and electrical means, appears to be racing along the ground. When it reaches the landing point, the pilot cuts his motor. Flint, shown inspecting device at left, also invented the low-altitude bombsight.



Dreamboat above combines comforts of home and attractions of life on the water. Living room, bedroom and bath are each 8 by 10 feet and there's a white-tiled shower. Known as the Hearn Houseboat, it is priced below $10,000. It's powered by a 45-hp gasoline engine; maximum speed, 7 mph. (See "Elsie M," MI, Oct. '45).

Mobile Sleeping Bag designed to permit the soldier to get into immediate action without having to fight his way out of the conventional type field unit is demonstrated at right by PFC Robert Wentermuth of Newton, N. J. The suit is not intended for wear in the daytime, only for mobility in surprise attacks at night under sub-arctic conditions.





New Sea Anchor for lifeboats will decrease drift after a sinking vessel has radioed the position of survivors. Weighted at the crown, it is made of nylon and has cork floats on the painter to keep it at the correct level below wave action. In size, weight, strength and ease of handling, it is a vast improvement over the old style drogue.

Isn't she pretty swell (the plane)? Gal doesn't come with plane—but if you have the plane the gal part is easy. What a setup for a weekend!

Winged Weekend

To introduce you, the gal is California's Miss Knight, seen picnicking far, far from prying eyes. With such a plane you could pick plenty of pretty partners for private picnic parties!

ALL weekends seem to have wings, but here's a pair of real wings for a real weekend.

Plane's a beauty, isn't it! Looks like a gull. Flies like one. Can take you to your weekend spot *fast*.

Dewey Eldred, who holds both speed and endurance records for light seaplanes, has designed this what-he-calls "pilot's dream ship." Seats two. Plenty of luggage room. Cruising speed 85 mph, and takes off in 10 seconds. Of course, there's a patch of water handy to almost everywhere.

Have a ship like this. If you can't, have a dream ship like this.

Looks like a gull. The inverted gull wings add to the prop clearance. View above gives a good idea of the roomy but trim baggage compartment.

candle builder

Christmas bells toll in summer for the candle-maker—he gets busy on cheery scenes like this. In December he makes valentines!

After this heartwarming tour, you'll agree that here's an artist.

BY WILLIAM A. BURNS, Assistant Curator, American Museum of Natural History

TO THE average person, a candle is something you keep in the kitchen cabinet and can't find when your electric power fails. But to the Ajello family, a candle is a work of art, to be designed and executed as though it were a painting.

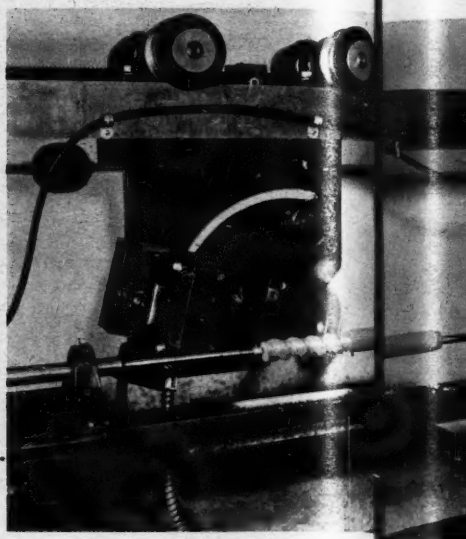
The Ajellos have been working with candles and wax figures for one hundred and sixty-six years and have been in the candle-making business in the United States since 1889 when Antonio Ajello founded the present firm bearing his name. The old candle-maker is gone but his sons are carrying on.

Essentially, a candle is nothing more than a wick and the material on which it feeds. But when you own an Ajello candle, it is a far cry from the smoky evil-smelling candle of by-gone days.

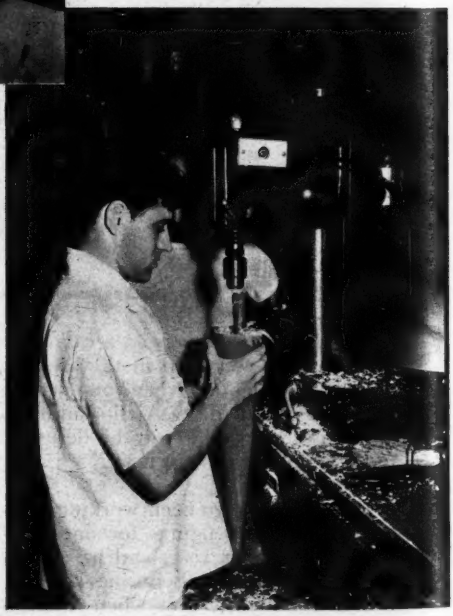
To begin with, these Ajello candles are designed for each purchaser. No two orders are alike. Second, their candles are all delicately perfumed.

This 6-foot beauty, below, is tiny compared with the Caruso "1800-Year" candle.

Ajello's twisting machine, below, replaces the hand-work of turning candles into delicate rope effects.



Another new process is the drilling of wick-holes—candles used to be dipped many times into hot wax.

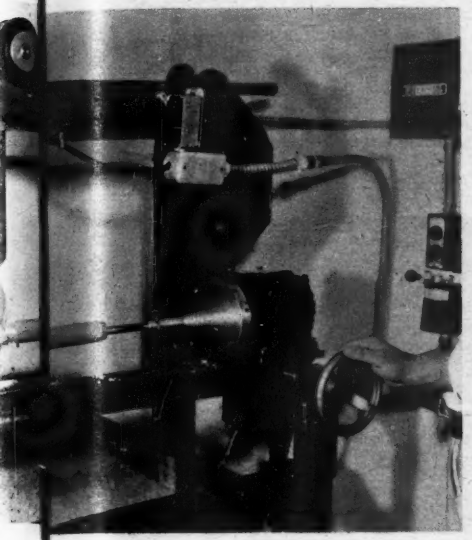


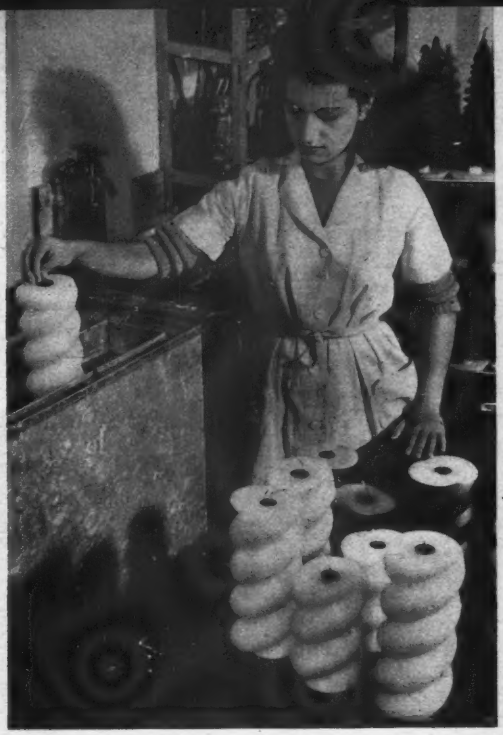
Let's say that your daughter is to be married and you want some fine candles to be used at the reception. You visit the Ajello offices and display rooms that huddle under the elevated tracks of the New York Central Railroad near 125th Street in New York City.

One of the brothers talks over your order—the size, the weight, the shape, the decoration and the perfume of your candles. Then your order is made up, perhaps a little larger than you need because candles are fairly delicate objects and some may drop or break. If there are any candles left over, they may be offered to a few choice customers. But you may be sure that you will not find duplicates of your candles at any other wedding in the nation.

Many famous people have ordered

There's still plenty of hand-work such as the blending of colors by dipping the formed candles into vats of dye—right.





candles from the Ajellos. The great actress, Eleonora Duse, a friend of old Antonio, made a prophetic utterance when she told the candle-maker, "Make these candles for me now . . . and afterwards!" She died a short time later.

Pavlova, the dancer, had a special kind of candle designed for her—realistic-looking snakes, tails in the air and vicious heads swallowing the candle butt.

On display in the office is a great waxen bust of Queen Victoria. This is not a massive candle but a figure of wax. In the same room are examples of two-candle twists, bayberry candles familiar to our Colonial ancestors, marbleized candles that look as though they were cut from stone, a beautiful lily from whose open blossom a pure white candle stems, candles sprayed with flowers, candles of all shapes, colors and abilities.

The Ajellos make their candles do what the customer wants them to do. Usually a candle should not drip but some people like the interesting pattern dripping wax makes when it hardens. So they make a candle that is guaranteed to drip in a most becoming manner. They also make candles that are guaranteed not to drip.

The greatest demand for candles comes around Easter, June and Christmas. Wedding candles make June a busy month. Christmas inspired the Ajellos to turn out candles in the shape of snowmen and snowballs, angelic-looking little choir boys in red skirts and white surplices, and a very special candle whose holder is a music box that plays gay tunes.

Over 200,000 candles, all from orders, have been wrapped and stored away for reference and remembrance. But for one order that was made up many years ago there is no duplicate and there never will be. That order was for the great memorial candle for Enrico Caruso, the Italian tenor.

Enrico Caruso was a warm personal friend of Antonio Ajello. When Caruso died, his old friend decided to make a memorial candle that would burn for 1800 years if lighted for one day a year only, on the anniversary of his death.

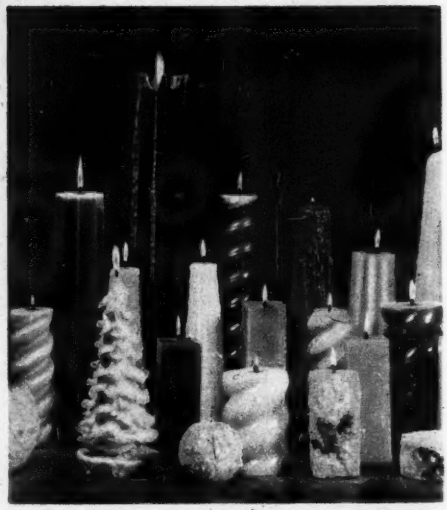
So the old candle-maker sat down and figured how to make a candle that would help to keep the name of Caruso bright. His computations were almost as in-

Photos by Koepper, Globe

Left: These hand-made candles and bust of Queen Victoria were made by Antonio Ajello, father of the firm's owner.

Over 200,000 made-to-order candles, like those below, have been wrapped and stored for reference and remembrance.

Bottom: This Christmas feature—an all-wax design of the Nativity—is a fine sample of the candle-makers' ancient art.



volved as those required to measure the heat from a distant star. When he finished his plans he decided that this candle would be eighteen feet tall and would weigh about one ton!

Six hundred times the candle was dipped, removed and cooled. Finally it was ready for shaping.

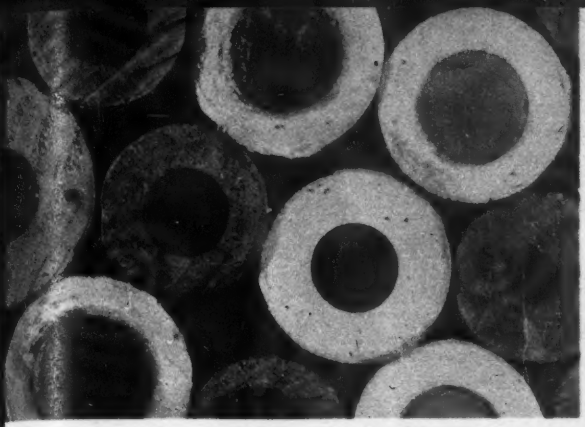
Sheets of wax, dyed and annealed, were laid out on warm slabs. Steel dies, bearing rose and lily designs, were pressed into the wax, cutting out the various sections. These were then picked up with long tweezers and applied to the body of the candle.

An oval was left near the base of the candle and in it, in oils, was painted "The Crucifixion" by Restivo, one of Caruso's favorite works of art.

The candle was finished except for one thing. Children of an orphanage, which had received large sums of money from Caruso, wished to pay the freight. Ajello engraved the name of each child on the candle's base.

The Caruso candle now stands in the Church of Our Lady of Pompeii in Naples. Once a year it is lighted for twenty-four hours.

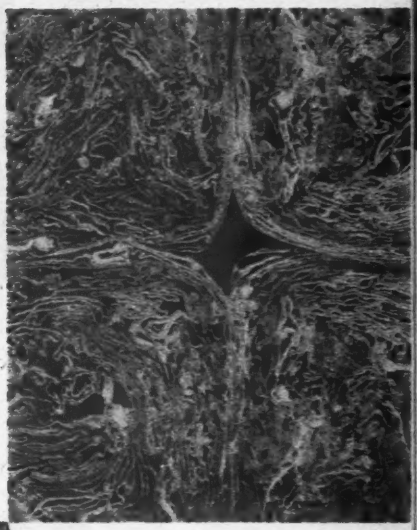
If the Caruso candle were to burn continuously, it would last for 43,200 hours or almost for five years. But burning one day out of every year, it will still be flaming in memory of Caruso in the year 3700 A. D.!



An enlarged picture of familiar objects. What are they? Doughnuts with colored holes? (Ends of colored pencils)

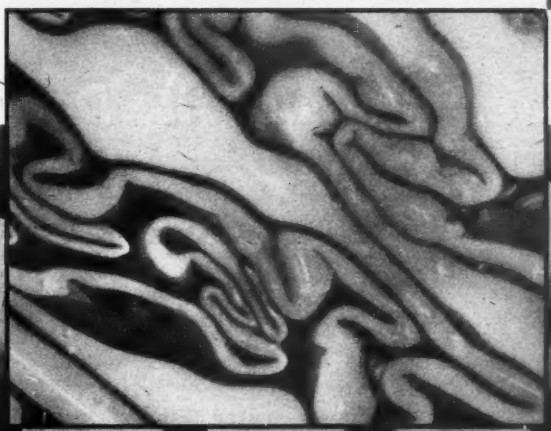
Here's where you stumble for sure. What's the stuff below? A breakfast cereal? (Ends of packaged cigars)

Photos by Harvey Weber, Graphic House

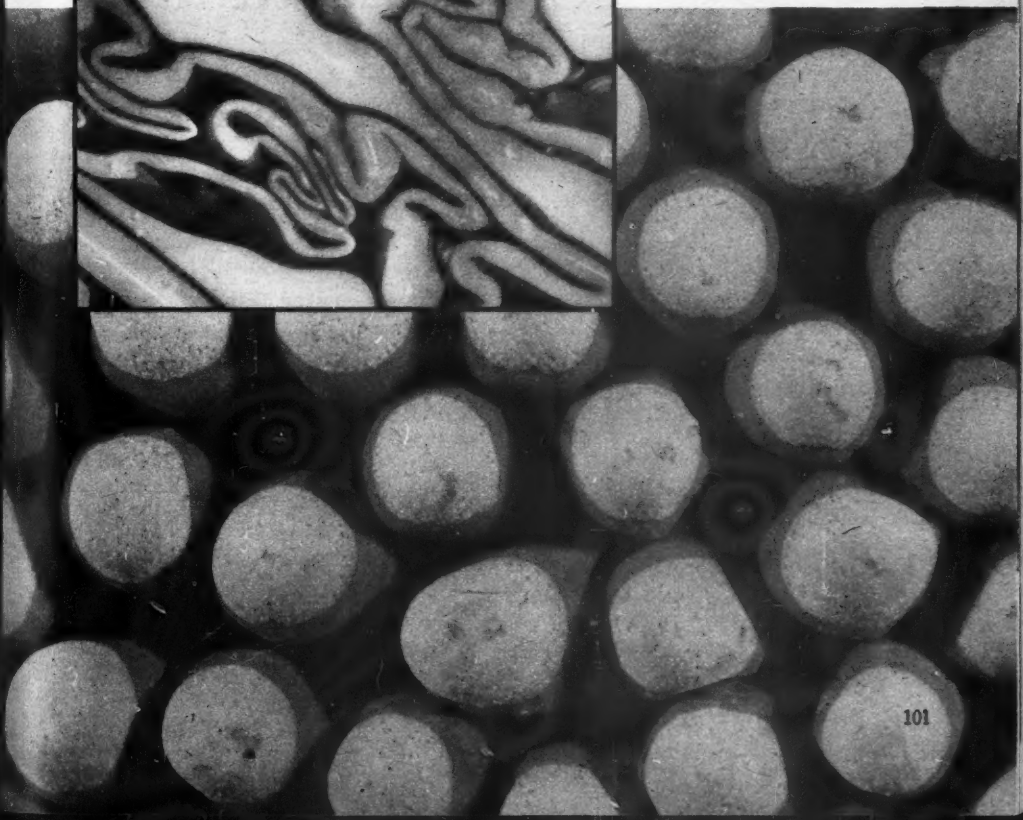


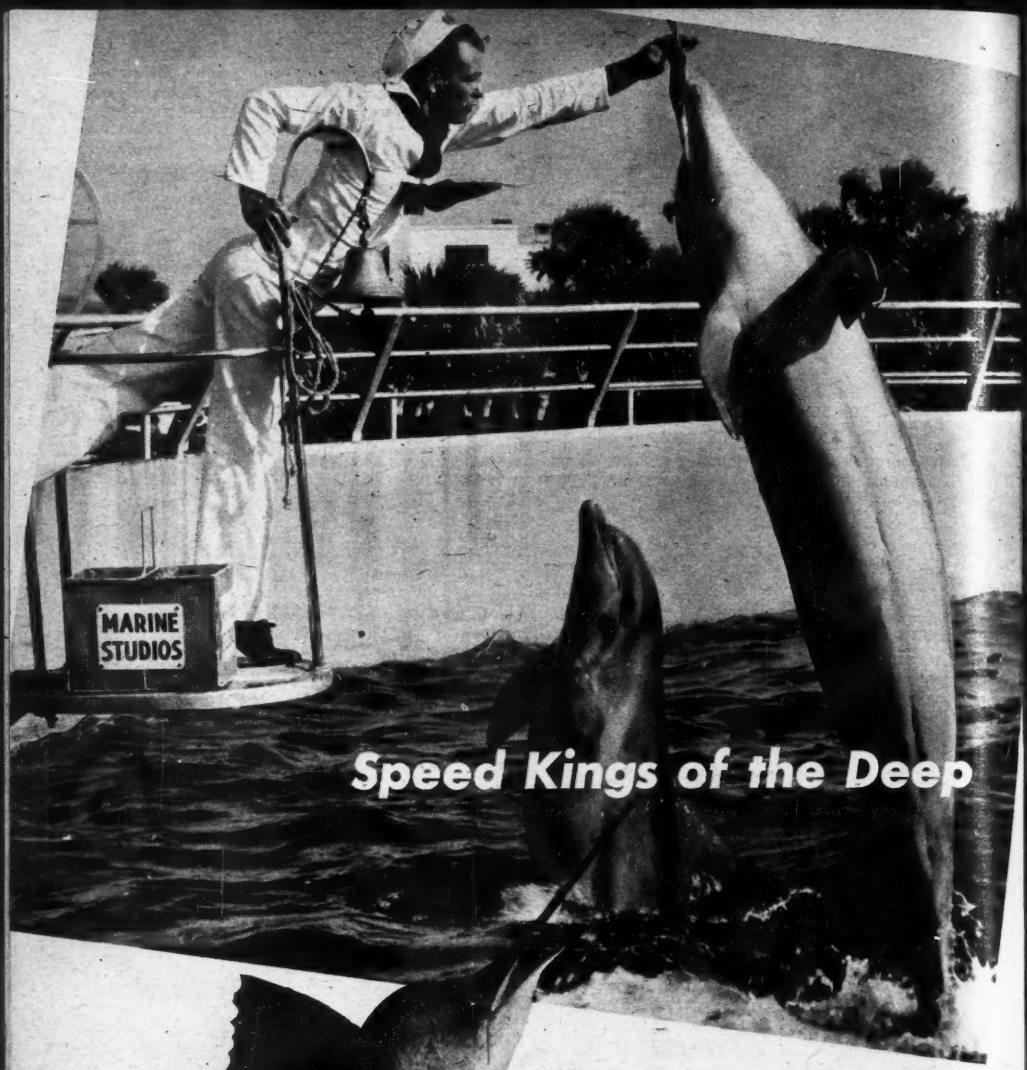
what is it?

Imagine you're an insect—maybe that'll help. Now look just below. What is it—a slice of brain? (Red Cabbage)



Acorns? Candy? No? (Is there a dimout of recognition? Give your memory the hot-foot!) (Matches)





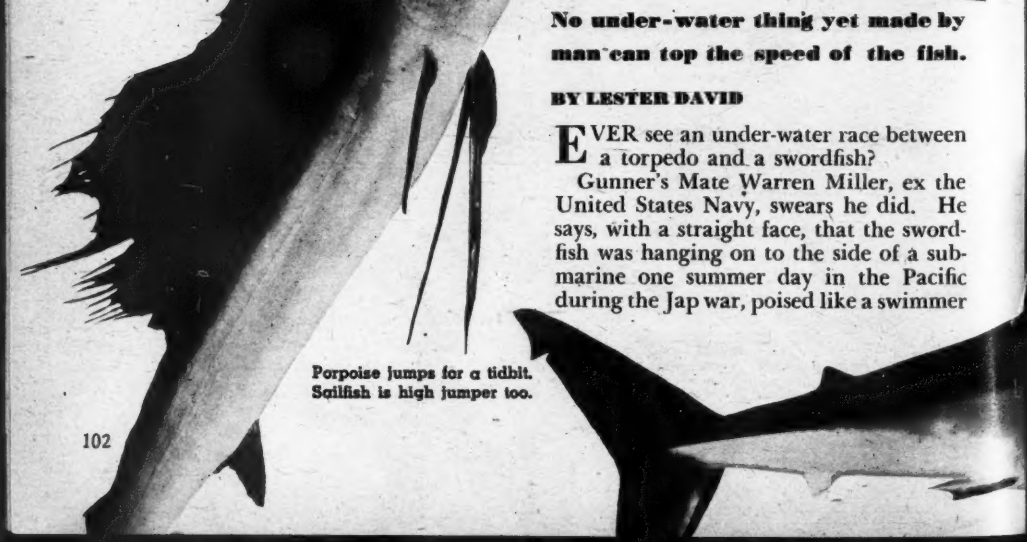
Speed Kings of the Deep

No under-water thing yet made by man can top the speed of the fish.

BY LESTER DAVID

EVER see an under-water race between a torpedo and a swordfish?

Gunner's Mate Warren Miller, ex the United States Navy, swears he did. He says, with a straight face, that the swordfish was hanging on to the side of a submarine one summer day in the Pacific during the Jap war, poised like a swimmer



Porpoise jumps for a tidbit. Sailfish is high jumper too.

awaiting the starter's gun—that when a torpedo was unleashed against an enemy destroyer 1,000 yards away the swordfish waited nonchalantly for about five seconds, then took off after it.

"That torpedo," Warren says, "went mighty fast, but that swordfish just made it look sick. At the end, the fish was leaning against the Jap ship waiting for the torpedo with a bored look on his face."

Hm-m!

The story may sound fishy but don't sell it short—because if it didn't happen exactly that way, it very well might have. Ask the timekeepers of the deep.

A torpedo, they tell us, hurtles through the water at an average speed of 40 miles per hour. A swordfish, however, can knife through at 60 miles an hour.

Man, the speedster, has always been fascinated by the rate in which he or his mechanical creations can blitz over a given distance. He knows how fast an airplane can whiz, how fast a motor can whir, how fast a man can swim, walk, run, drive a car.

He has calculated, using measured tracks, starters, judges and stop watches, that on land an athlete can attain a maximum speed of 21 mph in a short-distance sprint.

In the same way he has found that the fastest a champion swimmer can cover a measured short distance is slightly over 4 mph.

And now the speed clockers, discovering a vast new field yet to be charted, have gone under water and succeeded in timing the swimming speeds of aquatic animals. The results have left them puzzled and a bit abashed—because despite the mechanical achievements of science in an age of phenomenal power, members of the finny tribes are still the fastest things in their own kingdom under the sea.

Man's speediest under-water machine, the submarine, crawls at a top rate of only 15 mph, but the trout and the salmon, who are considered slowpokes by their aquatic brethren, breeze along at a comfortable 25 mph.

Some of the measurements are accurate to a hair, others must be considered only fairly close approximations. The fresh water fish were fairly simple to pin down: they were timed by a stop watch. The speed of fishes like the tunny and bonito was obtained by clamping a "fishometer" to a rod and recording the speed at which the line was torn off the reel by the hooked fish. The dolphin and porpoise were charted by comparing their progress through the water with the known number of knots at which the ship from which they were being observed was traveling.

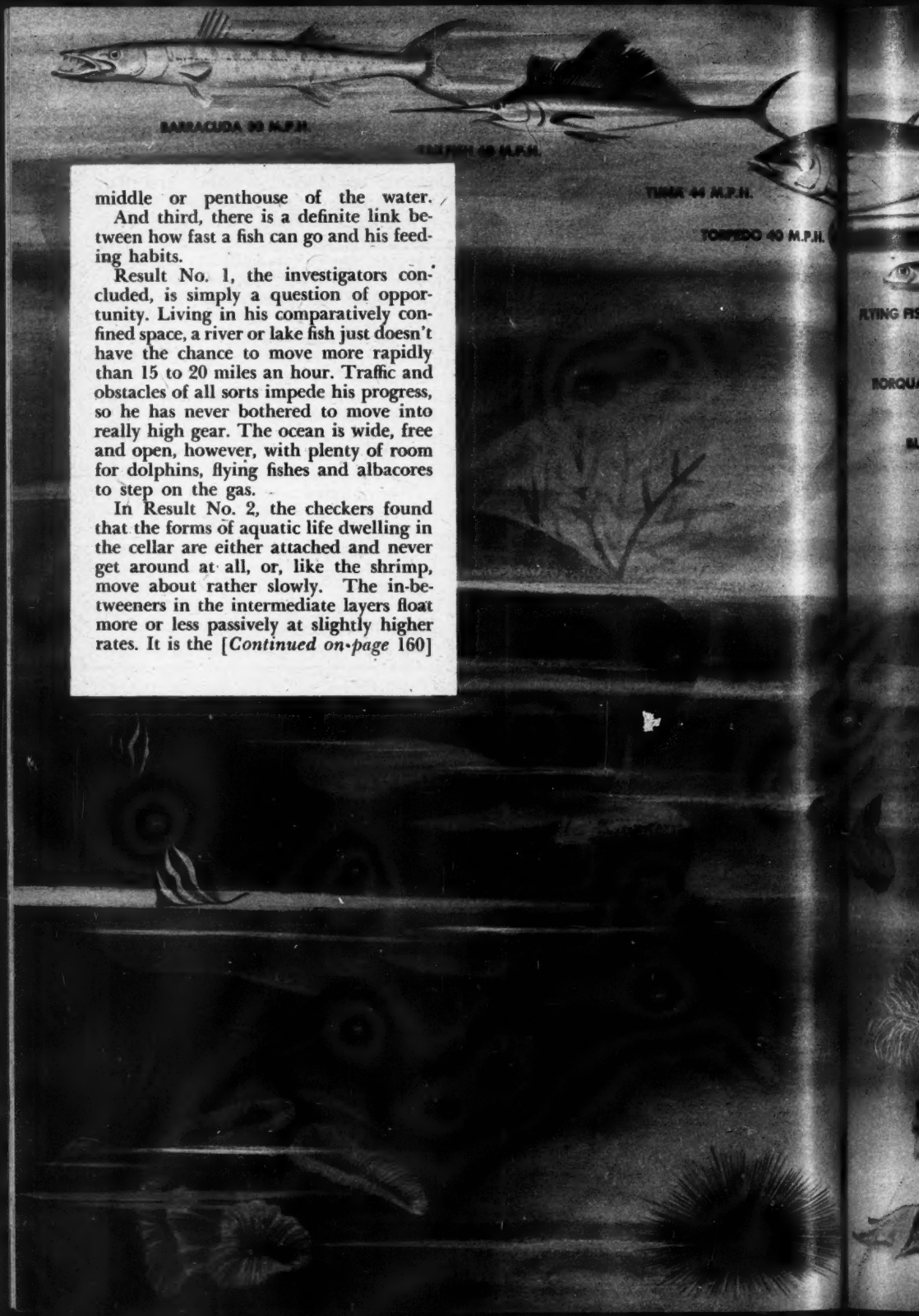
After correlating their data, the clockers noted three sets of general principles:

First, marine animals attain higher speeds than fresh-water fish.

Second, there is a sharp difference in the speeds of all fish depending on whether they live in the cellar,

The six-foot speed-body of the full-grown muskellunge makes it a terrific sprinter.

Left, an 11-foot white shark—a streamlined man-eater. Weissmullers, beware!

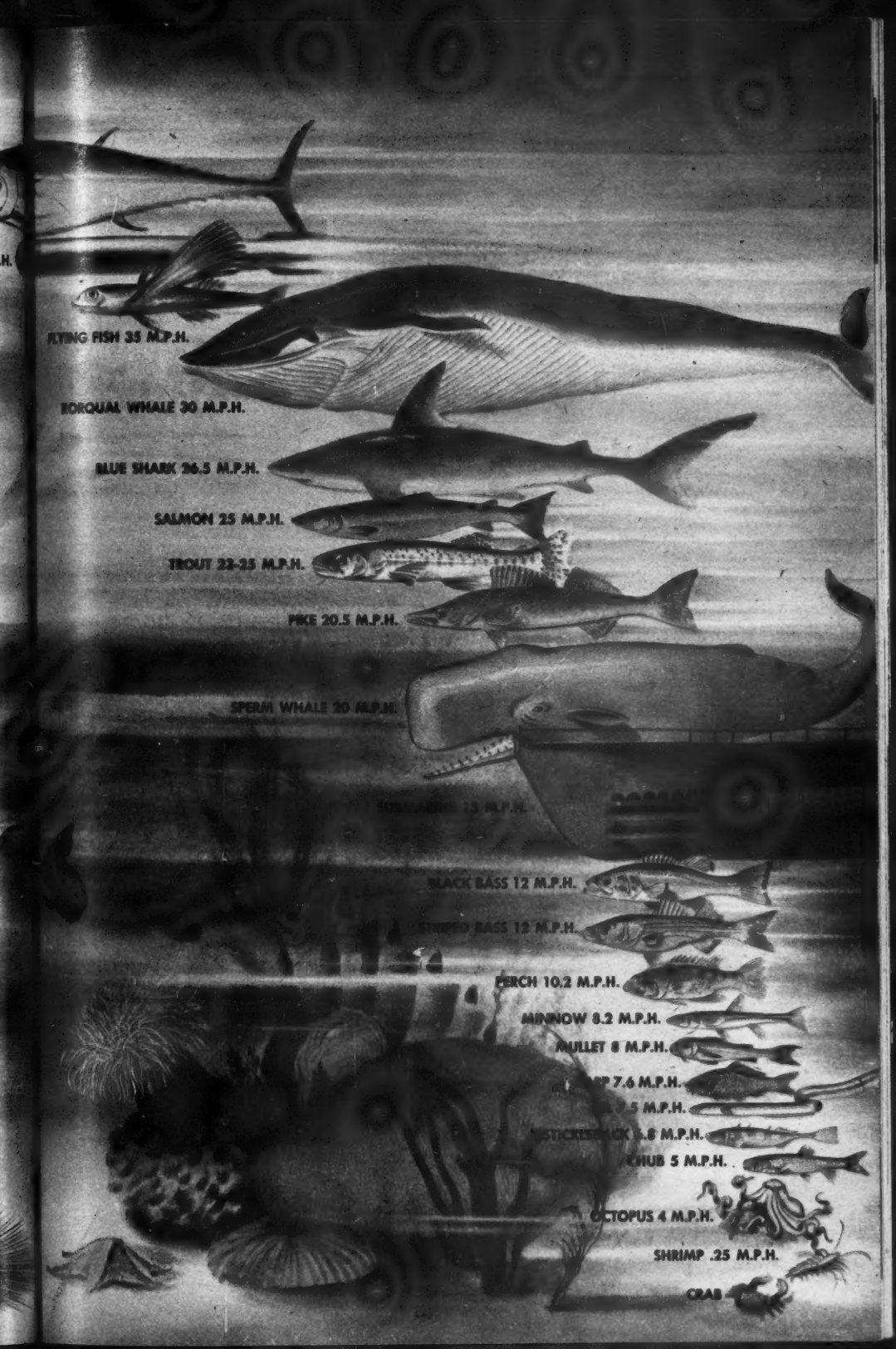


middle or penthouse of the water.

And third, there is a definite link between how fast a fish can go and his feeding habits.

Result No. 1, the investigators concluded, is simply a question of opportunity. Living in his comparatively confined space, a river or lake fish just doesn't have the chance to move more rapidly than 15 to 20 miles an hour. Traffic and obstacles of all sorts impede his progress, so he has never bothered to move into really high gear. The ocean is wide, free and open, however, with plenty of room for dolphins, flying fishes and albacores to step on the gas.

In Result No. 2, the checkers found that the forms of aquatic life dwelling in the cellar are either attached and never get around at all, or, like the shrimp, move about rather slowly. The in-betweeners in the intermediate layers float more or less passively at slightly higher rates. It is the [*Continued on page* 160]


FLYING FISH 35 M.P.H.
BORQUAL WHALE 30 M.P.H.
BLUE SHARK 26.5 M.P.H.
SALMON 25 M.P.H.
TROUT 23-25 M.P.H.
PIKE 20.5 M.P.H.
SPERM WHALE 20 M.P.H.
BLACK BASS 12 M.P.H.
STRIPED BASS 12 M.P.H.
PERCH 10.2 M.P.H.
MINNOW 8.2 M.P.H.
MULLET 8 M.P.H.
CHUB 5 M.P.H.
OCTOPUS 4 M.P.H.
SHRIMP .25 M.P.H.
CRAB

wee world

The Lilliputians would have found these miniatures useful, indeed.

IF GULLIVER had devoted himself to the hobby that keeps Joseph Gray busy, he could have made the Lilliputians feel more gigantic than the Brobdingnagians. Gray collects miniatures. He has thousands of them. Moreover, everyone of them works. He has a teapot which matches half-inch teacups. He has a cutlery set that would be only slightly outsize for a butcher in the ant kingdom. A library of 300 half-inch volumes can be read with a magnifying glass. Pinhead portraits of all the presidents fill one cabinet, and in another are more than 600 tiny pipes. On these pages we bring you the wee world and as much as we can get in of its assembler. Gulliver, you lived too soon!

Gulliver would have been warmly welcomed by the butchers of Lilliput if he could have brought them a cutlery set of paper-clip size like this one.

Every one of the miniature tools in the collection below, including four planes, has a definite purpose; Gray says there's not a dummy in the lot.

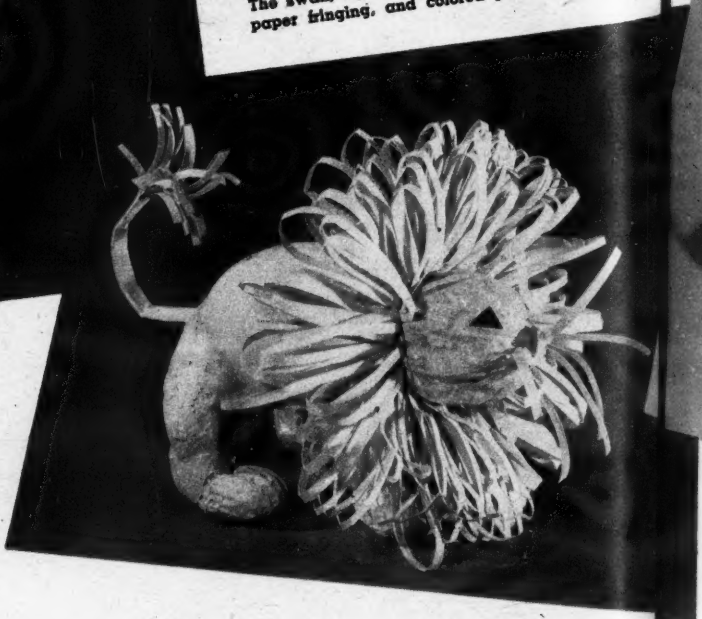
Above: There's ample room in a wrist watch case for this miniature silver service set.

Right: Gray says this tiny violin, which he holds in his hand, can actually be played.

The kangaroo, above, has a yellow-painted-egg body, a cotton pouch, and peanut legs.

The swan, top left, is made of egg, cotton, paper fringing, and colored pipe-cleaners.

The ostrich—with egg body, pipe-cleaner legs and neck, and a ball-with-a-hole head.



At right, the most fee-ro-cious lion ever made. Walnut head and peanut feet.

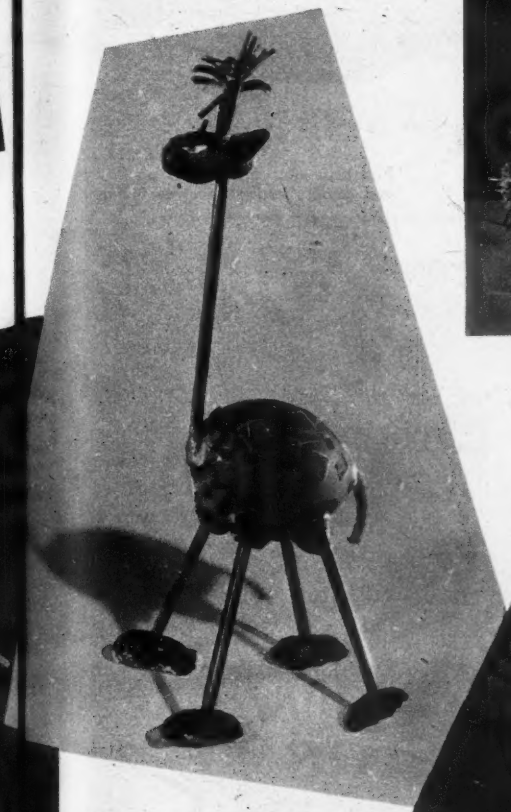
Photos by Leeser, Camera Clix

easter-egg zoo

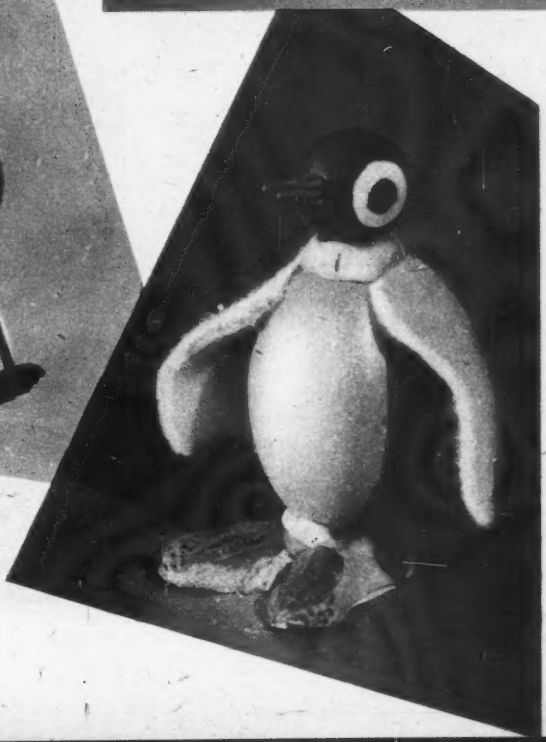
Make this zoo. It will cost almost nothing . . . the kids'll love it . . . and you'll have fun.

(More pictures on next page)

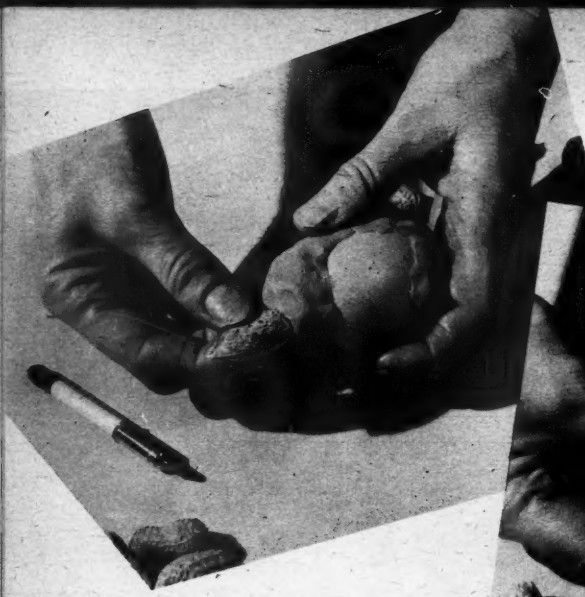
Mrs. Marchand puts the finishing touches on a porcupine (see next page). On the table stand a finished ostrich and deer.



The giraffe has neck and legs of red soda straws, of course.



Mr. Penguin. Egg, peanuts, clay, felt, and toothpicks.



Making a porcupine. A paper-shell nut is inserted into a clay neck on an egg.

Below, the last peanut leg is being carefully affixed to the roughed-out figure.

Head, feet, and all parts of the body not covered by clay are gaily painted.

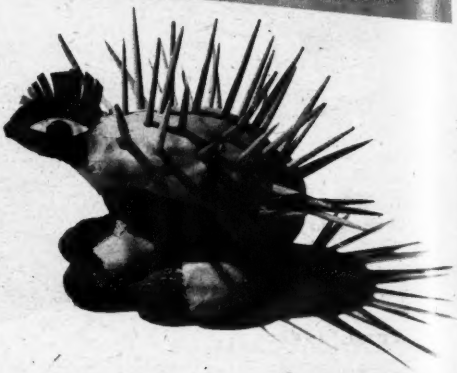
And last, after he's got his paper eyes and comb, "Porky" receives his quills.

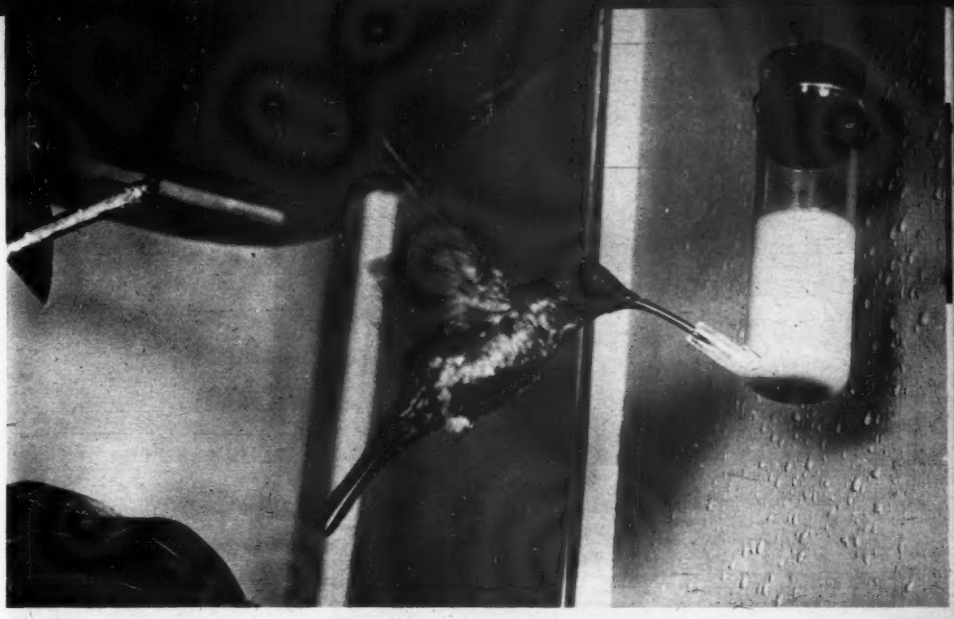
easter-egg zoo

BERTHE MARCHAND used her ingenuity. Needing something original for the Easter table—something for the children to admire—she hit on the idea of making an entire zoo of animals, using colored Easter eggs and other odd bits of material easily obtained for a few cents at any stationer's.

Why don't you do the same? It just takes patience, nimble fingers, and extreme care in handling the eggs—which can be dropped only once.

(Maybe you'd better boil them.)





LITTLEST GANGSTERS

You'd never guess the delicate hummingbird is really a vicious killer—he's the Dillinger of the bird world.

YOU wouldn't think it to look at him, yet the little hummingbird is a cold-blooded killer, by far the most vicious of all North American birds.

He's only three inches long and so light that he can travel first class on a three-cent postage stamp, yet he'll take on anything from a bug to a hawk, and usually comes out winner.

A desperate duelist, he will thrust his long, needle-like bill into another bird at the slightest provocation.

And he's a lone ranger, picking on his own kind as readily as anything else

Top: Hummers burn up energy fast—every 10 minutes they hit the feed bottle. In it is milk, honey and vitamin extract. Left: George Scott, of the Bronx Zoo, feeds a fledgling.

His top speed, believe it or not, is 250 mph. Yet he weighs less than a penny.

Photos by Leeser, Camera Clix

Below: That innocent looking bill is a sword—its target: the enemy's heart.

that stands in his way.

Two hummers battling in mid-air over food provide a thrilling fencing match that no earth-bound swordsmen can match for incredibly swift darts, parries and feints. Lightning-like maneuverability is the principal defense and the target is the heart. For hours they swoop and dart, until one knocks the other from the air with a sudden slash.

This maneuverability is the envy of aviators. They can hover in one position, move up or down, backward or sideways on wings that beat without tiring from 55 to 75 times a second. They can dart off at any angle in a burst of dazzling speed, brake on a dime, and zip off again.

Battles are frequent between hawks and hummers, and the little spitfire invariably sends the big bomber scuttling away, puzzled and tired and wounded.

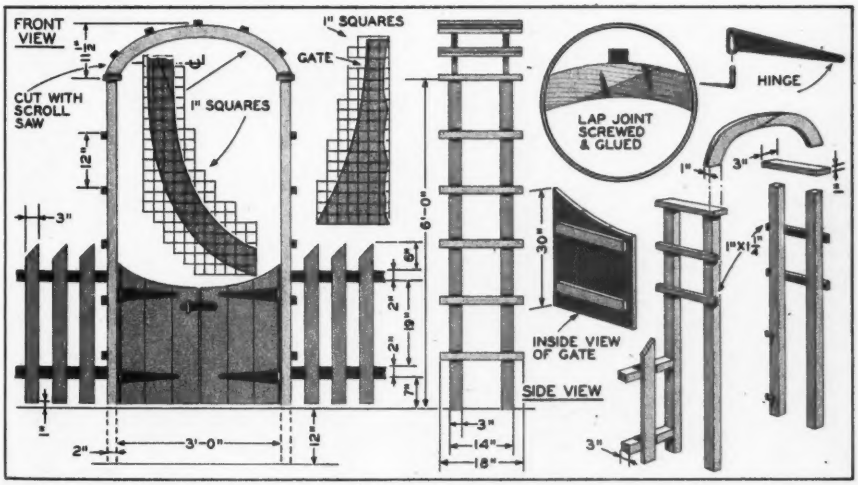
Hummingbirds meet their waterloos in spiders' webs, or they may be impaled on thorns or stuck fast to thistles or milkweeds. Their average lifespan in captivity is one and one-half years.—*Lester David.*

garden gateway

An attractive gate that says a cheery "welcome" to guests.

THE appearance of the most commonplace lawn will be vastly improved with this simple gateway. The curved top members can be cut with a coping or keyhole saw. Note that each arch is made in two pieces.

Use 2x3's for the uprights with cross pieces spaced one foot apart. The ends of the posts which are set in the ground should be tarred or creosoted.



Let Mother Nature help you build this graceful garden set.

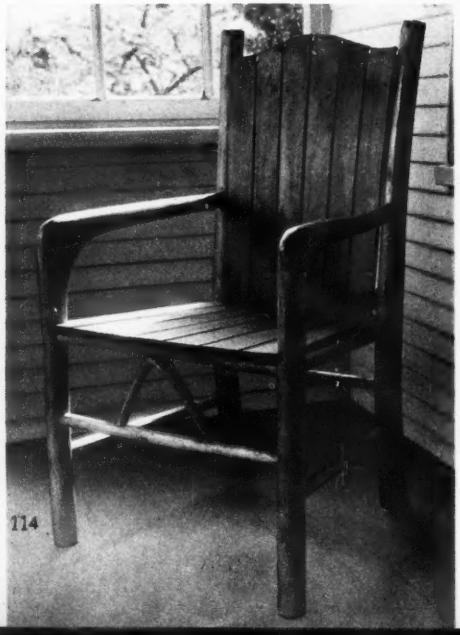
BY EDWARD R. LUCAS

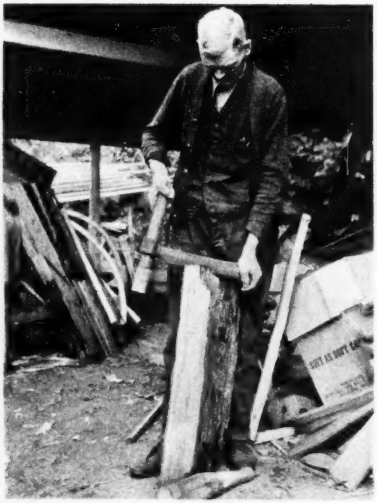
Photos by F. R. Johansson

Left: Finished table ready for refreshments or a card game. Sections of top are glued up from shakes or regular lumber.

Lower left: A set of chairs like this are handy indoors or out. The original furniture was made of Western red cedar.

Below: Splitting boards from a log with the help of a shake knife. Deadwood can be used but it must be sound and dry.



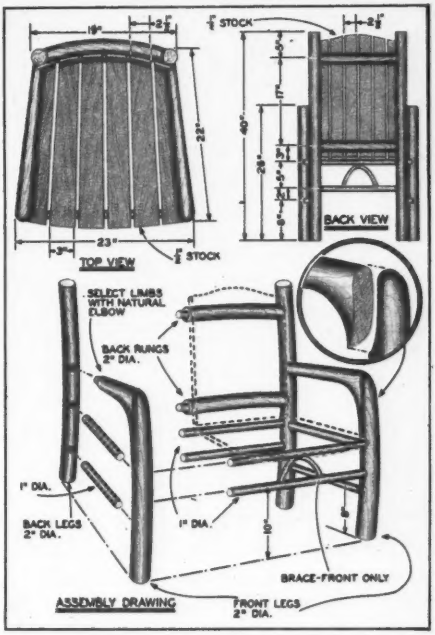


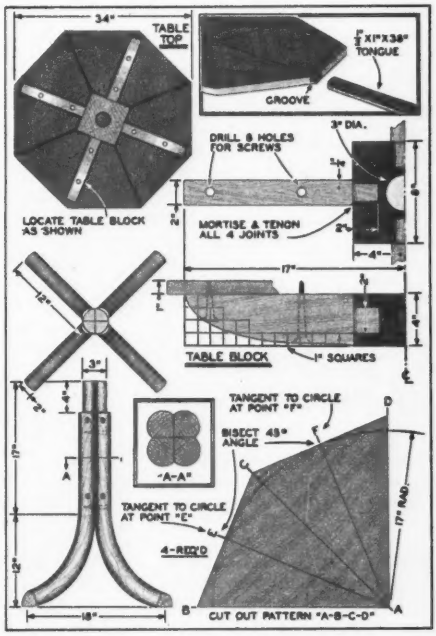
rustic table and chair

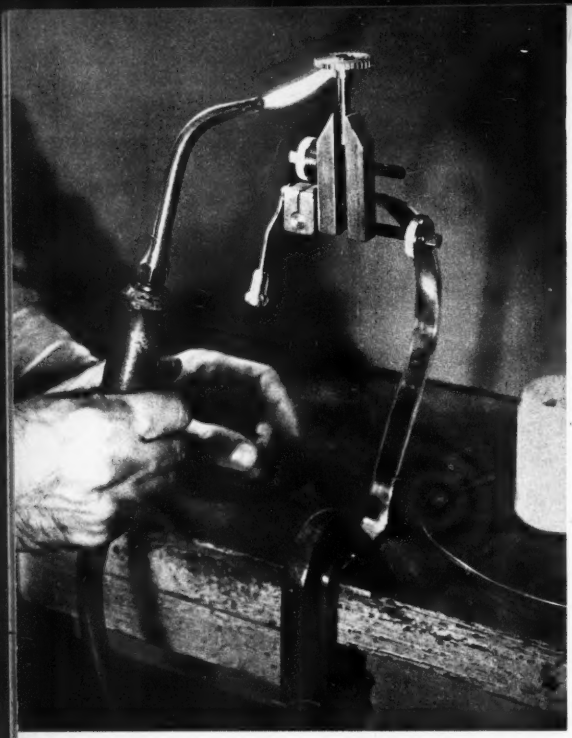
HERE'S something different for that shady spot in the backyard or the empty space at the end of the porch. It's a set of sturdy, lightweight furniture that's easy on the eye and the chassis when you relax in it. Best of all, the cost is almost nil for it's made of naturally bent tree limbs from the nearest woods, plus a handful of screws and nails.

When you're out hunting for the wood (preferably a soft one), choose limbs with a natural "elbow" or crook for the front legs and arms of the chair while for the back legs and rungs, pieces with a slight bow will do the trick. Start operations by gluing together the two side sections, consisting of the front and back legs, plus the side support. Then drill matching holes for the back rungs and supports (both front and back) allowing for an angle in drilling as the chair is 4 in. wider at the front than the back. After they are assembled and glued, level the tops of the upper front and back supports and nail the seat slats in place. Cut out the ends of the outer ones to clear the legs. The back slats are then nailed to their supports and the tops cut to the desired shape. Give the front of the seat slats the same treatment and follow it up by nailing the side pieces in place.

The base of the table comes next, using four naturally curved limbs cut square on two sides to form a roughly circular section. After the legs are glued and screwed together, cut them down to a diameter of 3 in. at the top to fit the hole in the table block. This piece is your next chore and can be made of commercial lumber or split from a deadwood log (if it's sound) with a shake knife as shown. Either way, bore the 3 in. hole, mortise and tenon the arms and dress their upper surfaces so they're level. Following this, drill the eight holes and glue the block in place over the 3 in. end of the base. The next step is to make a pattern for the four parts of the top and after cutting them to shape, rout out a ½ by ½ in. groove in the inside edges. To assemble the top, cut the two tongues and mortise for the intersection at the center. Then join all four sections on top of the block, leaving a narrow crack between them for expansion in wet weather. Apply a coat of clear varnish after sanding, and your job is done.







Using the vise to hold a shaft while a gear is being soldered to the end. Head can be adjusted to any position.

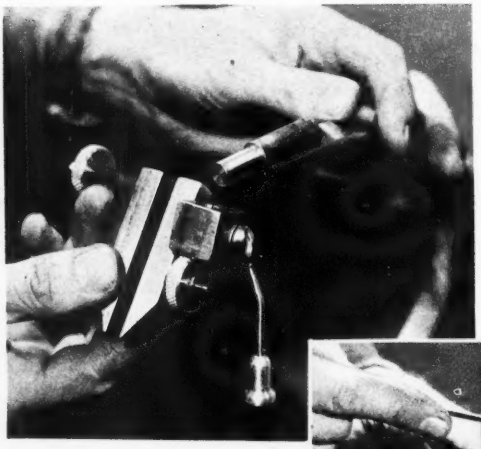
"Swan's-head" VISE for your shop

BY WALTER E. BURTON

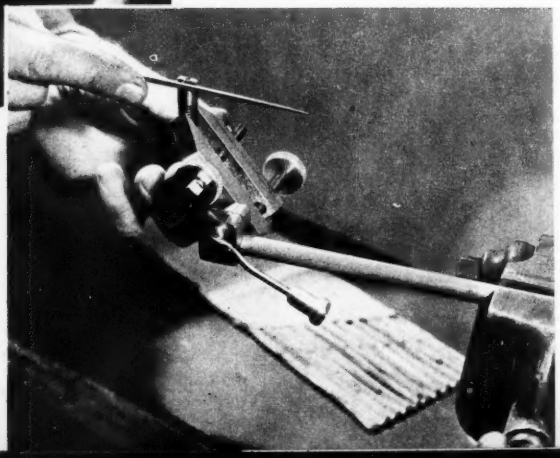
LOOKING somewhat like a swan's head, and being able to turn in as many ways, this easily made workbench vise has dozens of uses. Its chief value is for holding small parts that are being soldered or brazed, or that are being worked with files or other tools. It will also serve as a fly-tying clamp for the angler, as a holder of painted or lacquered articles while they dry, as a gluing clamp for model airplane parts; for supporting a magnifying glass, holding small objects that are being photographed, and for dozens of other purposes.

The vise consists of four main parts: (1) The jaw assembly, which may be made from a small toolmaker's clamp or fashioned in the form of such a clamp from bar stock. (2) A split block and locking bolt. (3) A ⅜ in. stud mounted on a curved arm or similar support and (4) a clamp for securing the arm to a bench or table.

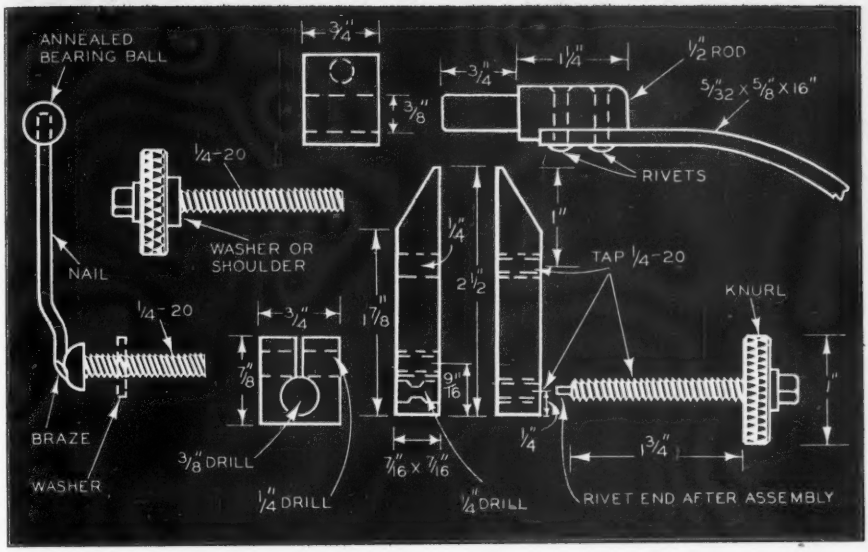
Dimensions of the jaws are shown in the drawing. If you have no clamp or similar size that can be used, make the jaws from square cold-rolled or tool steel and drill and tap them for the ¼-20 screws as shown. The screws may be ordinary round, hollow or square-head bolts equipped with knurled knobs that are run tightly against the heads. Leave the original bolt head as it is, so you can



Above: Installing the vise of a ⅜ in. dia. stud mounted on the curved support. Stud fits into split block.



Right: A more rigid mount for the vise is provided by a straight rod held in a conventional vise.



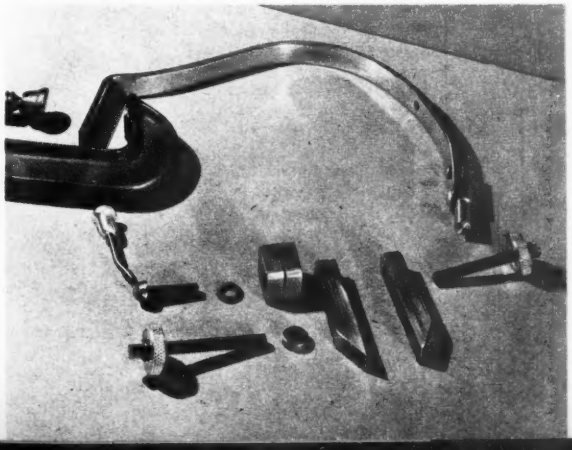
use a wrench or screwdriver to tighten or loosen the vise, if necessary.

The split block provides the universal action that permits the head to be adjusted to innumerable positions. Make it from cold-rolled or hardenable tool steel. Drill the 3/8 in. hole and then drill a 1/4 in. hole at right angles to it. Finally saw the slot that provides the desired springing action when the bolt running through the 1/4 in. hole is drawn tight. About 9/16 in. from the square end of the vise jaw that has the two unthreaded holes, drill a hole with a No. 7 bit and tap it for a 1/4-20 bolt. This bolt, about 1 1/8 in. long, has a convenient handle tipped with a knob of some sort. You can make the handle from a nail, bending it as shown and brazing it to the bolt head. The knob may be made by annealing a 1/2 in. bearing ball, drilling a hole almost through it, and driving it over the nail end or securing it by brazing. Use a washer between bolt head and block for smooth operation.

There are a variety of supports that may be used for the vise. That shown was made by bending a 16 in. strip of 5/32 x 5/8 in. chrome-plated steel into an arch and riveting to its upper end a stud made by turning a 1/2 in. bar to 3/8 in. diameter for a distance of 3/4 in. and flattening a portion of the 1/2 in. section so it rests firmly against the strip. The lower end of the strip is shaped so it rests firmly on a bench or table top, where it is secured by a C-clamp. It can be left separate or riveted or otherwise fastened to the clamp jaw.

One objection to the use of a flat strip is that it is inclined to be springy. A solid 1/2 in. bar, bent in the same shape, would be more rigid. Also, you should have available a 6 in. length of 3/8 in. steel rod, or a larger rod with one end turned to 3/8 in. so the split block of the vise can be clamped to it. When clamped in an ordinary vise, such a rod provides an extremely rigid support for the more rugged filing operations.

For maximum service, the jaws should be hardened. If made of tool steel, heat treat them.



Parts before assembly. The jaws can be made or taken from a toolmaker's clamp.

Right: A junior operator tuning in on a short-wave receiver which uses a small power unit using the 403D2635 rectifier.

"SELENIUM RECTIFIERS"

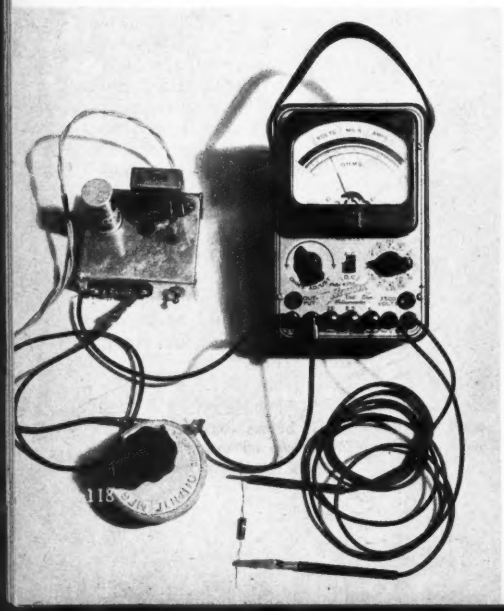
—an aid to the radio experimenter

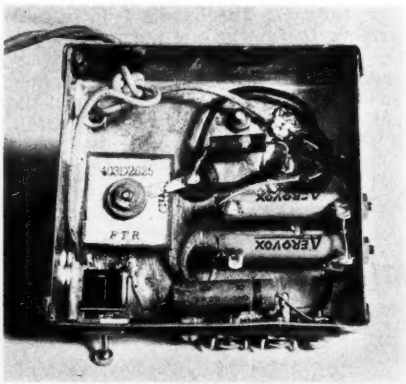
BY RICHARD L. PARMENTER, W1JXF

THE new selenium rectifiers which were placed on the market recently by the Federal Radio and Telephone Corporation offer many advantages to the beginner in radio, as well as to the more advanced worker. They are small, compact and easily installed, and they will replace any of the light-duty type rectifier tubes commonly used in AC-DC and "universal" small receivers. While this is a definite advantage in itself, since many of these tubes are still rather hard to get due to the heavy demand, this is primarily of benefit to the serviceman who is interested in securing his replacement parts easily and inexpensively. As for the experimenter and set builder, there are many advantages to be derived from using these rectifiers in preference to the customary tubes. This is especially true when the voltage required is in the neighborhood of 100 volts.

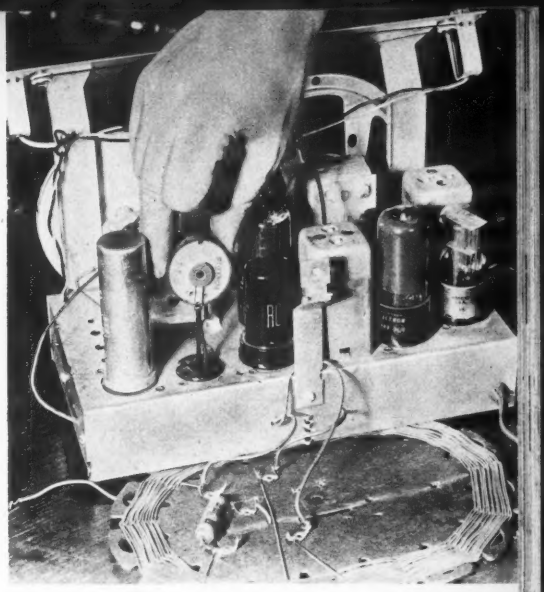
When using the type 403D2625 rectifier, which is rated at 100 milliamperes, a 25% gain in voltage is noted as compared to the use of a tube. This of course gives a corresponding increase in power output. This unit provides sufficient power for many uses in the experimenter's workshop. In new construction this particular type is especially advantageous since its small size permits it to be easily installed where even a rectifier tube would be too large. It is easily mounted; it needs only one hole to clear a 6-32 machine screw. It is preferably mounted below the chassis.

Below: Illustrating the use of the selenium powered rectifier unit (left) in extending the range of an ohmmeter for checking resistors.





Above: Bottom view of the power unit shown in the other two photos on this page. Wiring is included in bottom part of diagram on next page.



Right: How a selenium rectifier is used as a replacement for the rectifier tube of an ordinary radio receiver. Extension leads are soldered to the lugs of the rectifier and these are inserted in the proper terminal holes of the tube socket.

For experimental purposes, a small power supply which delivers approximately 100 volts is a very desirable substitute for batteries. The unit shown in the photos has been used to power several small receivers, as a DC source for a resistance bridge and as an external voltage source for high-resistance measurement with a volt-ohm-milliameter. The percentage of accuracy is of course limited when using it for the latter purpose since the voltage is not controlled. If the supply is to be used for this purpose a great deal, it would be advantageous to incorporate a voltage regulator tube and a potentiometer so as to provide for accurate control. Other improvements suggest themselves here, of course, but they will be dependent upon the individual's desires and needs.

To supply power for small experimental receivers this unit as shown in the photos and in Fig. 1 is particularly handy. For the receiver included in Fig. 1 a filament transformer was used. This could have been eliminated by using a line cord dropping resistor or ballast tube, but this would have necessitated the use of shunts across the filaments of the 6K7 and the 6SJ7 since they only draw 0.3 ampere while the 6K6 draws 0.4 ampere. Obviously, if a series connection is desirable for the filaments, a better choice of tubes could have been made. This is to be left to the discretion of the reader, since probably the tubes used will be the ones that are available, which was true in our case. This article is more on the side of suggestion than an attempt to prescribe specific uses for the rectifier units. Probably in this case it would have been preferable to use tubes with higher filament voltages, such as 12, 25, 35 or 50, in order to make for more efficient use of the power involved.

In the event that different tubes are used, it is well to keep in mind that the proper impedance match must be observed in the output circuit in order to obtain optimum performance. Similarly, correct values of bias and load resistance

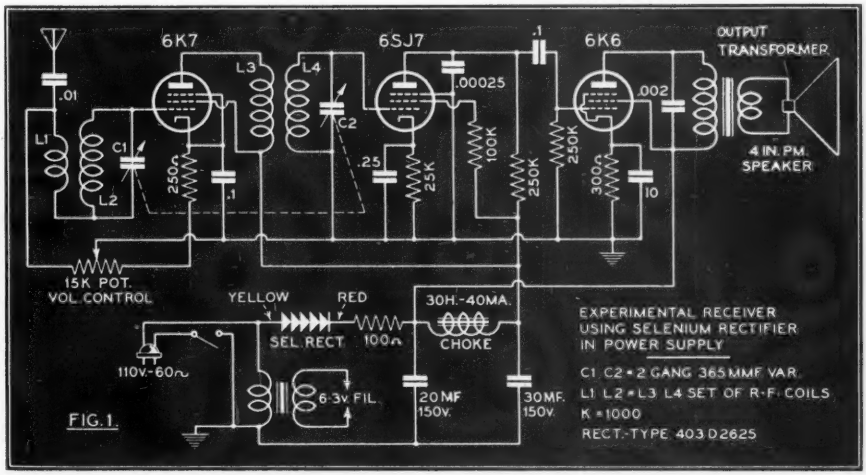


FIG. 1.

FIG. 2 - VOLTAGE QUADRUPLER CIRCUIT

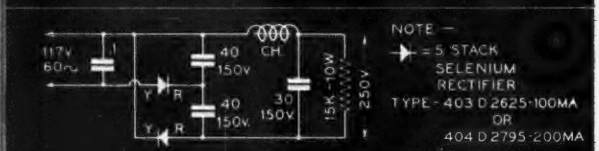
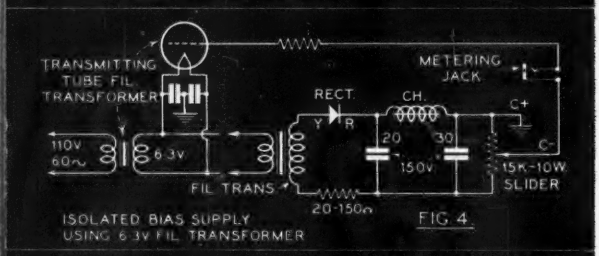


FIG. 3. - VOLTAGE DOUBLER CIRCUIT



ISOLATED BIAS SUPPLY
USING 6.3V FIL. TRANSFORMER

FIG. 4

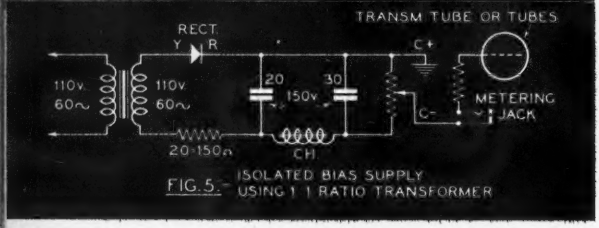
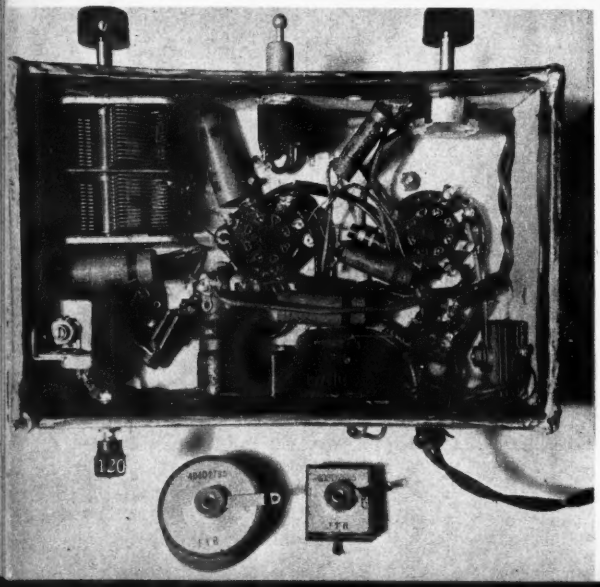


FIG. 5. - ISOLATED BIAS SUPPLY USING 1:1 RATIO TRANSFORMER

Below: The two small objects at bottom are selenium rectifiers of the 404D2795 (left) and 403D2625 (right) sizes. A unit of the latter type has been installed in the extreme lower right corner of the radio set.



must be used. Reference to a tube manual is here advised. The receiver is of the straightforward tuned RF type involving no trick circuits and even for the beginner it should present no major problems.

For the amateur radio operator who has his own transmitting station, a number of uses will be found for selenium rectifiers. For receivers, signal generators, audio oscillators, etc., these compact units are ideal as a power supply component. See Figs. 2, 3, 4 and 5.

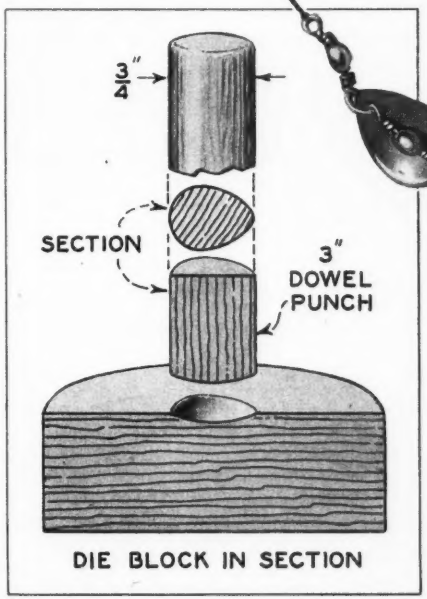
The rectifiers are especially useful for bias supply, as suggested in Figs. 4 and 5. Fig. 5 uses a 1:1 ratio isolating transformer which keeps the line voltage off the transmitter. The other, Fig. 4, uses a 6.3-volt filament transformer hooked up in reverse, so to speak, so that the 110-volt side is used as the secondary. This system is mentioned due to the fact that probably a 6.3-volt filament transformer will be more available in the home workshop than the other type. The 6.3-volt side of this transformer is connected across the 6.3-volt side of the transformer which supplies the filament power for all the tubes in the transmitter. The same system would apply to other filament values, of course, providing the correct amount is available for bias voltage. This hook-up automatically applies bias to the transmitting tube or tubes before the plate power is applied, thus eliminating the possibility of damaging the tubes by excessive current being drawn due to lack of excitation. The other system uses a 1:1 ratio transformer and its primary is connected in parallel with the filament transformer primary to accomplish the same result as in the previous case.

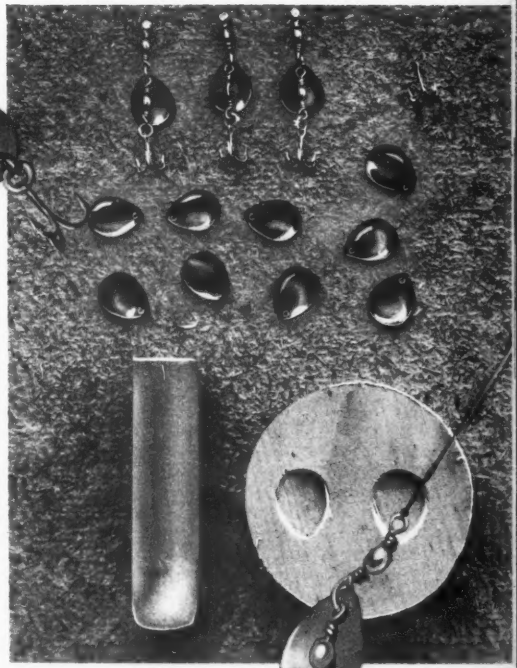
For the experimenter who occasionally will require a power supply with higher potentials, there are other methods of obtaining these. The manufacturer makes three other sizes with 75 ma., 150 ma., and 200 ma. ratings, all at 130 volts input, so a wide variety of combinations is possible. For instance, if a potential in the neighborhood of 250 to 270 volts is required, the circuit shown in Fig. 3 may be used effectually. This is a voltage doubler circuit similar to that used for many radio sets [*Continued on page* 162]

Black Spinners for Trout

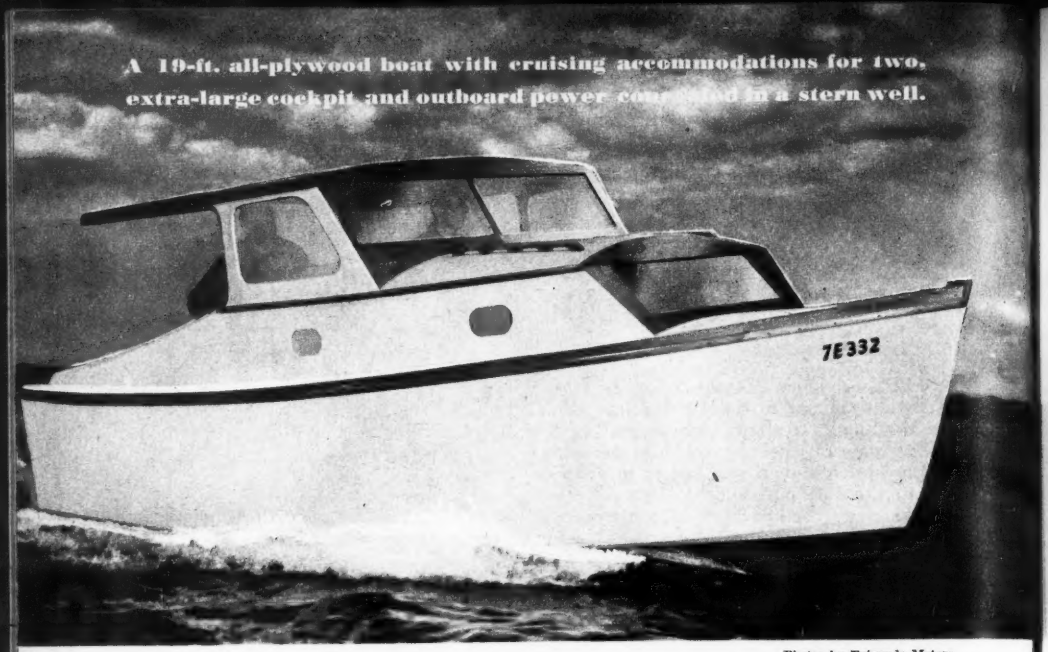
HERE are some effective black fly lures that you can turn out in jig time. First cut the blanks to shape from a small piece of 22 gauge soft sheet brass. Then make the maple punch shown and use it to form a die in the soft pine block. Next, lay the blanks over the die one at a time, and form them by striking the punch sharply with a hammer. Following this, drill the holes and file off any sharp edges. The spoons are colored by dipping them in copper nitrate and heating with a blow torch until the metal turns dark brown. To finish the pieces, give them a coat of wax and add the treble hooks, swivels and rings, then look out Mr. Trout.—*Dick Hutchinson.*

Using the wooden punch and die to form the shape of the spoons. Note finished pieces to left.





Right: Completed spinners at the top, formed spoons below them and the stamping set at bottom.



A 19-ft. all-plywood boat with cruising accommodations for two, extra-large cockpit and outboard power concealed in a stern well.

Photos by Evinrude Motors

BUILDING Cruise-Mate

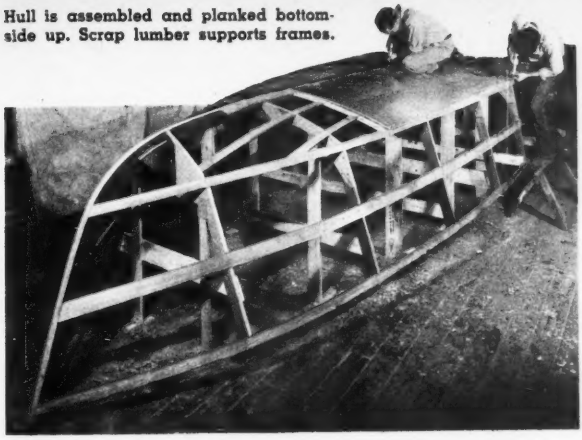
BY WILLIAM F. CROSBY

DESIGNED for short cruises on protected waters, Cruise-Mate is the ideal boat for the man who wants to enjoy a weekend or a few days more afloat without spending a fortune to do it. Modern in design and constructed almost entirely of plywood, the boat provides good cruising accommodations for two with ample cockpit space for larger parties on day trips. The recommended power is an Evinrude Speeditwin Motor of 22 hp. fitted with a 5 in. extra length shaft, and installed in a well at the stern. With this motor, or another make of the same size, Cruise-Mate should do between 12 and 14 miles an hour with two persons on board. By mounting the outboard at the stern, the space normally taken up by an inboard engine has been used to provide a surprising amount of cruising space for a boat with an overall length of exactly 19 ft. and a beam of 8 ft. 5 in. The freeboard at the bow is 3 ft. 5 in., while at the stern it narrows down to 2½ ft.

Below decks the cruiser has two berths that will take six footers (not the usual shelves designed for Singers midgets), space for a small stove and ice chest, plus ample stowage space under the berths and in the rope locker forward. Obviously you can't get full headroom in the cabin of a 19 ft. boat without raising the top out of all proportion. However, there is over 4 ft. under the cabin carlins which means good sitting headroom. Anyway you'll spend 90% of your waking hours in the cockpit where there's full standing headroom of 6 ft. and excellent visibility through the two windshields.

Before getting on with the actual construction, a few "don'ts" about the plans. Don't try to change them by making the boat longer, shorter or increasing the beam, you'll only get a cranky craft. Another one, don't try to install inboard power in Cruise-Mate. She was designed to support most of the weight well aft and if you slap a heavy converted Model A forward, she'll go down at the bow and stay there for the rest of her life.

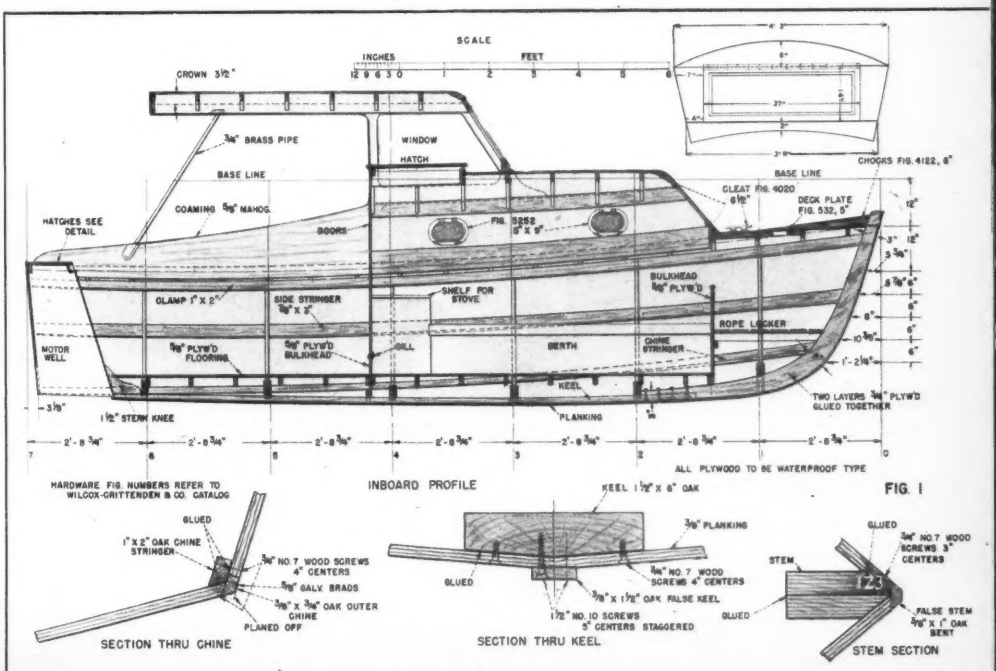
Now, let's take a look at the plans before you start your hammer and saw exercising. You'll find all of the drawings on these pages appear in reduced form which means that for the frames, stem, transom, etc., you'll have to lay down full-size paper patterns. This job will be a lot easier with the large-scale drawings of Cruise-Mate that are available from the MECHANIX ILLUSTRATED Reader Blueprint Service. Figure 1 is called the Inboard Profile and gives dimensions of the



Hull is assembled and planked bottom-side up. Scrap lumber supports frames.

stem, keel, frame spacing, transom rakes and a lot of other details. It is used with Fig. 2 on which you'll find all the necessary dimensions for laying out the frames (the numbers on these refer to the station numbers below the keel on Fig. 1). Figure 3 has the fancy name of Mid-section Scantling and gives everything you'll need to make the frames, besides showing how the cabin and canopy top go together. Incidentally, Cruise-Mate was designed with developed surfaces (no sharp bends or compound curves) so you can wrap large sheets of waterproof plywood around the frames for the planking and save time and labor. However, you can substitute solid cedar or mahogany planking, ½ in. thick, backing up the seams with ¾ by 1½ in. battens, notched into the frames.

After you've filled the bill of materials, let's get down to work. The best way to build the boat is bottom-side up and your first operation on the hull, is to lay out the shape of the stem on building paper then cut it out from two layers of ¾ in. plywood, glued and screwed together. The keel is made next and notched into the stem, using bolts to fasten the two pieces together. Next in line are the frames which should be laid out on paper using the dimensions shown on Fig. 2. Note that these are given from the baseline to three points, the keel (at the centerline), the chine and the sheer or deck edge. Distances are also given outboard from the centerline to the deck edge and the chine. The last two points are connected by a straight line drawn for each frame but the line between the chine and keel is curved for all but the last frame. This curve is important if you're planking the boat with plywood. However, if you're using solid planking, a straight line may be used between the



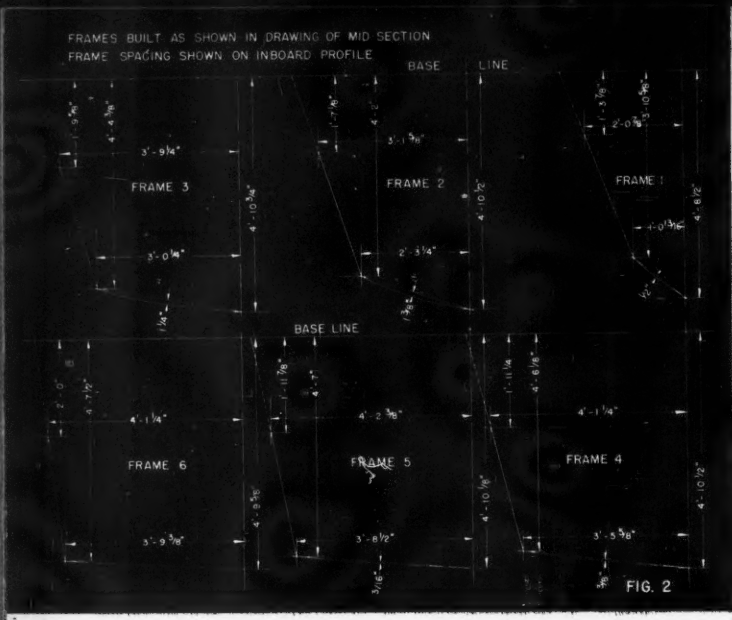
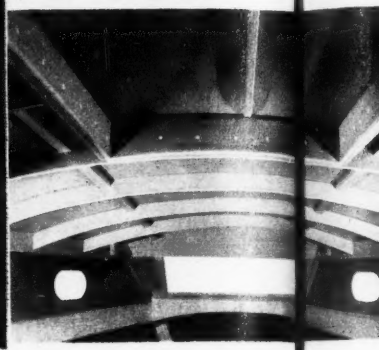


FIG. 2

Cruise-Mate Blueprints

Large-scale prints are an aid in constructing this boat. For complete information, turn to page 142.

Interior of cabin framing showing details at forward window and companionway.



two points. Each complete frame on both sides of the centerline should be drawn full size and the frames and floors constructed over the paper pattern, reinforcing them at the chines as shown in Fig. 4. After the frames are completed, nail a strip of scrap lumber across the tops to strengthen them. Then snap a baseline on the floor, mark the number of stations off according to Fig. 1 and erect the frames in place. Don't forget that the baseline on Fig. 1 is at the top of the drawing which is the exact opposite of the position in which you'll build your boat. When you erect the frames along the baseline, brace them with scrap lumber and set each frame up to the distance from the baseline shown on Fig. 2. (Frame 1 for example should be 1 ft. 3⅞ in. off the floor.) Note that Frames 1, 2, 3 and 4 are set up with the aft side of each exactly on the station line while Frames 5 and 6 are erected aft of the station line. This makes it easier to bevel the frames, your next step, and one you begin by springing a light batten around the frames to get the correct bevel for each. The frames are then beveled accordingly.

With all the frames in place and beveled (so the planking will lay flat on them later on), place the stem and keel in place,

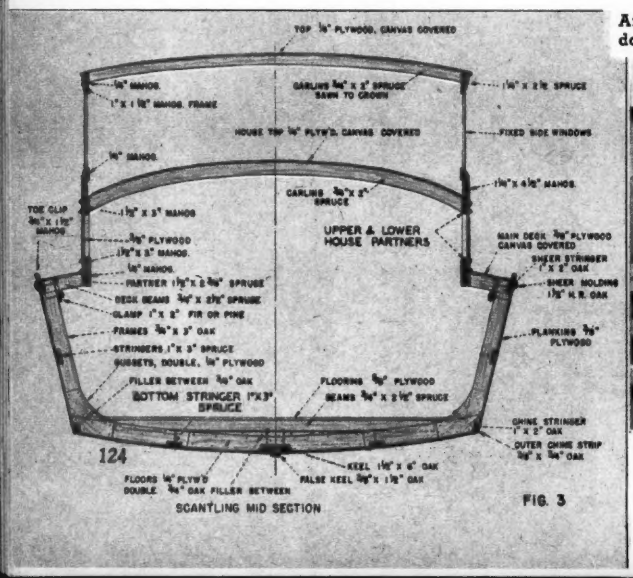
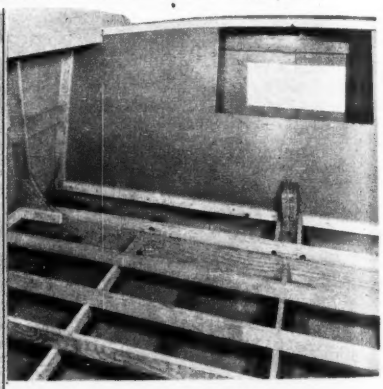
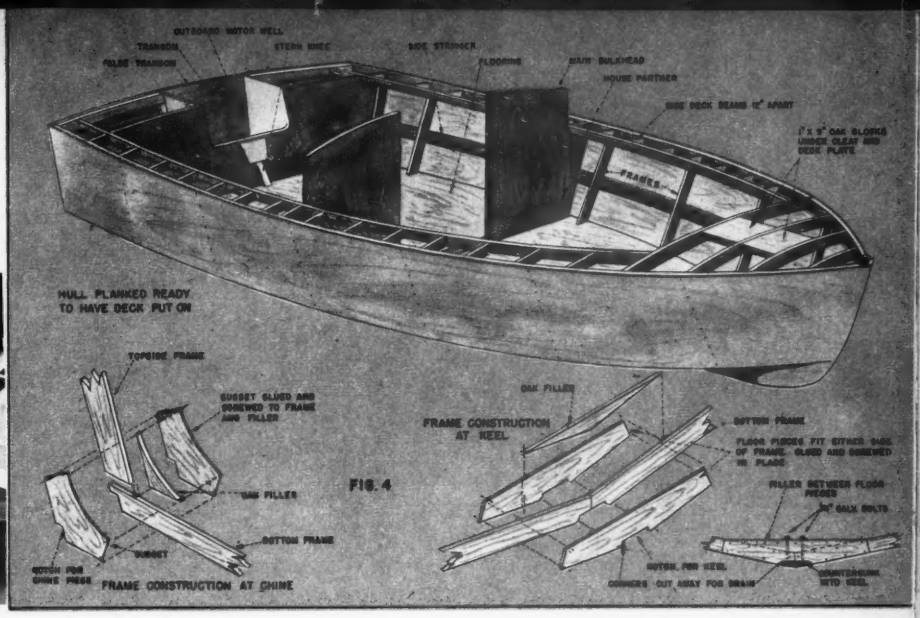


FIG. 3

Aft view of cockpit showing floors, double transoms and motor compartment.





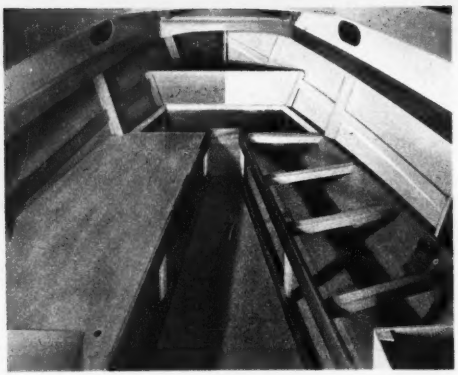
then notch the frames for them and bolt them through as shown in Fig. 4.

The next step might be called "Operation Transoms." Both the inner and outer transoms (the false one) are laid out on paper following the dimensions in Fig. 5 and cut to shape. Glue and screw an oak cheek piece around the edges of both pieces to strengthen them. The inner transom mentioned is then hung on the aft end of the keel and bolted in place with a plywood knee. The outer transom is then erected the correct distance off the floor and lined up the right distance behind the inner transom.

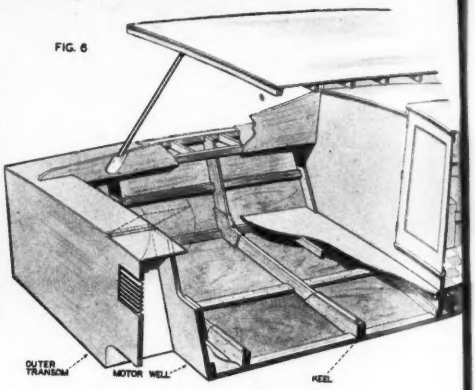
The next step is to notch the frames for the fore-and-aft stringers, beginning with the sheer, side ones, the inner chine piece and last the bottom stringers. Space the side stringers midway between the deck edge and chine, and the bottom stringers halfway between the chine and centerline. Note that the inner transom is notched for all stringers and for the clamp. However, the notch for the keel is only cut in the cheek piece as the keel butts against the inside transom and doesn't pass through it as the other stringers do. On the outer or false transom, only the cheek pieces are notched for the stringers which butt against the inside face of the transom. Fasten the stringers in place one pair at a time (one to port and one to starboard) to avoid springing the frames out of position, and then glue and screw fasten them to the frames and stem and transoms. The position of the stringers is clearly shown in Figs. 3, 4 and 6. The clamp is fastened in place last, dropping it down on the frames far enough so the deck beams will rest on it. You can complete the motor well now, by installing the fore-and-aft bulkheads shown at the bottom of Fig. 5.

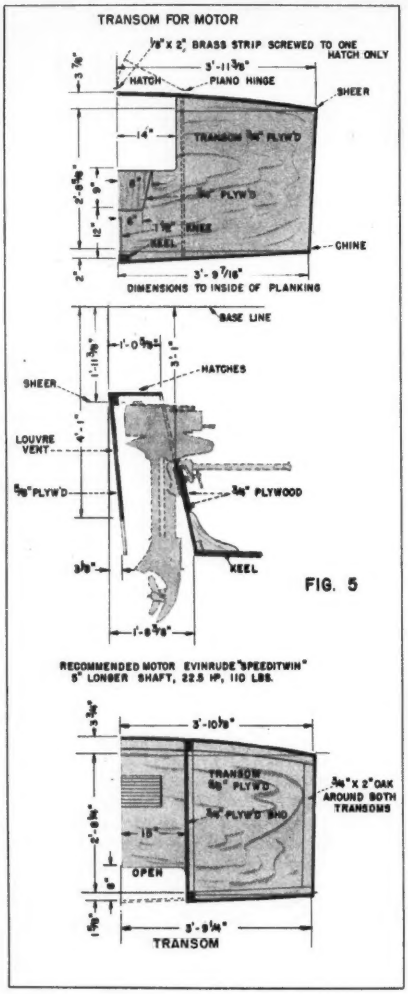
Hull completely planked with cabin framing ready to be decked and house sides installed.

When you've finished this last operation, step back and admire your work. It's beginning to look like a boat now—isn't it? But don't look too long, get out your plane and using the sprung batten trick again, bevel off the stem, keel and transoms so the inside of the plywood planking will lay flat and smooth. In putting on the planking itself, there are a few



Bow view of cabin interior with the berths installed.





things to remember. First, begin at the stem and work aft—it's easier to bend it that way. On the curved areas, make a paper pattern first before you cut the sheet and save time and precious material. Before screw fastening the plywood in place, coat all members of the framing with a good marine glue. Back up all seams with good sized battens, glued and screw fastened. Where the sides and bottom planking meet at the chine, leave a small gap so you can cut a groove later, using a power router or small rabbet plane. Make this large enough to take the outer chine piece which is glued and bradded in place after the planking is on. At the stem, plane the plywood off square and bend, glue and screw fasten a false stem in place. In similar style, a false keel is glued and screwed in place over the bottom seam of the planking. Details for all of these pieces are shown at the bottom of Fig. 1. By using them, you won't have any exposed plywood edges to soak up water and split or warp. When these pieces are in place, plug up all screw holes and seams with a good marine filler and when dry sand them smooth.

For your next step, get the services of a few husky friends. You'll need them to help turn the boat right side. With the cruiser in a normal position, knock out the temporary strips across the tops of the frames so there's room to put in the bulkheads, various partners, deck beams and other parts of the topsides construction. The details of all these members are clearly shown in Figs. 3 and 4 so you shouldn't have any difficulty with them. The crown of the deck is ½ in. for each foot of beam so that the maximum crown at the widest point would be about 4¼ inches. By making a master beam for this widest part, you can easily lay off the crown for all the other beams.

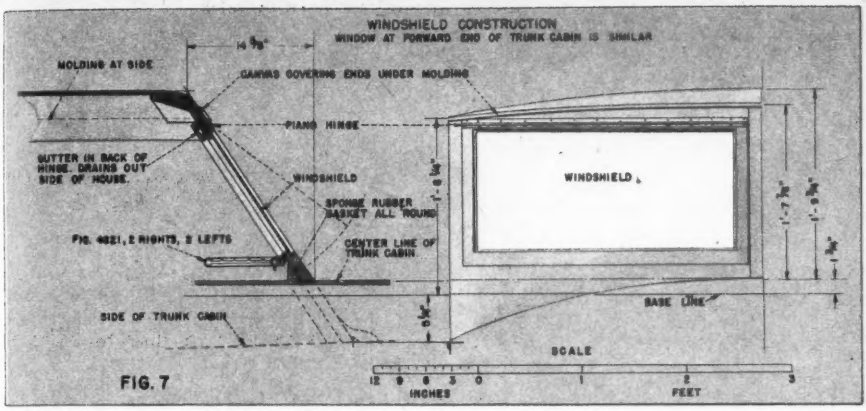
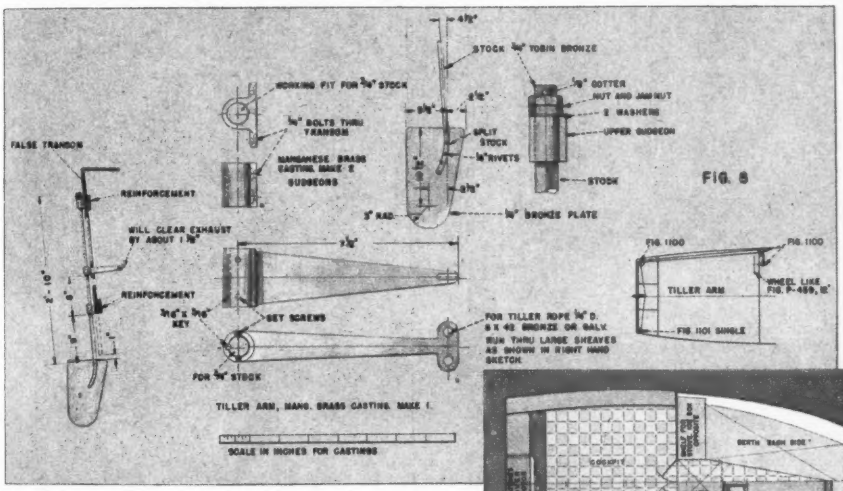
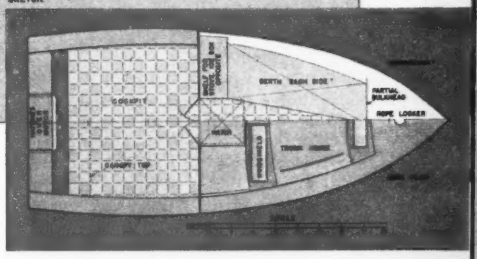


FIG. 7

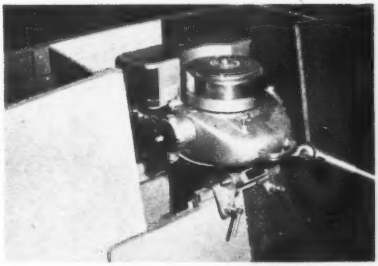




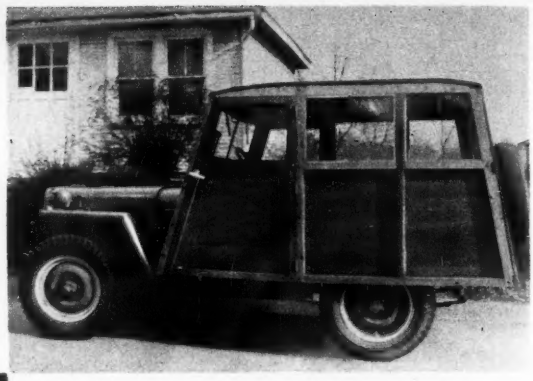
The deck which will be canvas covered, goes on after all the beams and deck partners are in place, but before the deck house or trunk cabin is installed. At the side, the top of the deck at any particular station should be the distance from the baseline to the sheer as shown on Fig. 2, plus ⅜ of an inch (the thickness of the decking). In other words, the tops of a frame are ⅜ in. below the sheer point shown on Fig. 2. To avoid future leaks, lay the deck canvas before putting on the house. Tack the canvas down under the sheer molding first, using copper tacks, then run it across the deck and under the lower house partner where it is tacked again after that piece is in place. The inside trim will cover the canvas and tacks.

The trunk cabin or house is your next construction chore, following the details in Figs. 1 and 3. Both the upper [*Continued on page* 158]

Motor is locked in stern well and rudder on false transom used for steering.



Jivin' up the Jeep



FOLLOWING the publication of articles in the October and November 1946 issues of MECHANIX ILLUSTRATED, readers in practically every state have sent in ideas for improving the comfort and utility of the versatile and popular Army jeep. Here are a few suggestions of general interest. We will publish others in forthcoming issues. If *you* have any useful hints or kinks, send them to Joe Jeep, c/o MECHANIX ILLUSTRATED, 67 West 44th Street, New York 18, N. Y. Good snapshots are especially wanted. A payment of $5.00 each will be made for acceptable ideas.

Photos above and upper right show the attractive station wagon built by Stuart Luginbuhl, 2600 Melrose Avenue, Norwood 12, Ohio, with the assistance of his father and uncle. Excellent all-around visibility is the feature of this converted jeep. The body is built of plywood, with 1½ inch oak posts bolted to the original body. The rear part was extended 16 inches to give a graceful slope. Windows are Plexiglas.

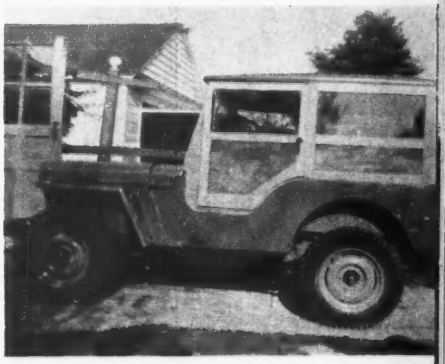
Above: E. J. Veronda, Box 211, Ukiah, Cal., for three years a Navy C.B., believes in having a really rugged top. The covering of his jeep consists of a bolted frame of ¼ by ¾ inch iron, over which he put a layer of building paper and metal lath. Over this he troweled a coat of plastic material compounded of three parts fibred asbestos and one part Portland cement, and for a finish he glued light canvas in place. Front sliding doors are ⅝ inch plywood.

Left: This ingenious spare-tire lock is merely one of the safety-belt eyerings removed from the dashboard and fastened to the tire carrier. A ring slot is cut in the outer disk. Idea came from Karl E. Gaston, P. O. Box 132, Neosho, Mo.

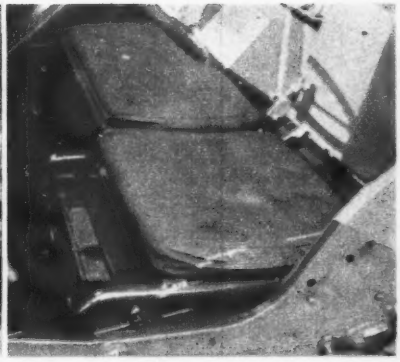
Right: A small cab instead of a full body satisfies the needs of Richard H. Hicks, 238 Clinton Avenue, North Plainfield, N. J. The top is made of ¼ by ½ inch slats covered with canvas; the sides are ¼ inch plywood. Rear window is sheet plastic. Open back is convenient catch-all for cargo.

Below: C. R. Day, 3231 Imperial Street, New Westminster, British Columbia, retained the canvas top of his jeep and added plywood doors and a fixed plywood rear section. Rear window is from an old Buick. Flapping of canvas top was eliminated by running wood strips from windshield to rear bow.

Below: Unlike the job on the opposite page, this station wagon by John A. Bennett, Jr., 11036 Whittier Avenue, Detroit, Mich., conforms to the original lines of the jeep. The framework and the doors are of maple, the panels plywood. The top is made of 2 inch slats, packed with cotton to give it shape and then covered with canvas.



Below: Leo S. Hoyt, Tide Mill Road, Hampton, N. H., used sheet iron for the curved top and Masonite for the doors of this elegant looking "wrecker," which handles any passenger car with ease. He moved the rear seat alongside the driver's seat (as in photo in lower right corner) and can carry two people in addition to himself.

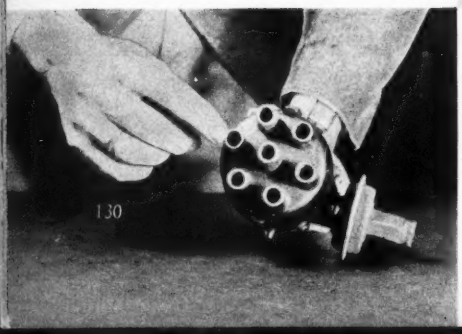


car care

Pitted master brake cylinder usually indicates the use of an inferior brake fluid. The best practice is to replace rather than to hone.

Worn rings usually cause oil consumption. In this case piston was at fault. Part of second ring groove fused allowing oil to pass freely.

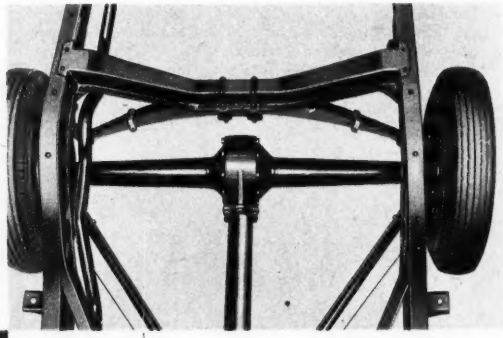
Cleaning contacts of distributor head helps ignition. It's also a good idea to seal the spark plug wires by melting some wax around the terminals.



SOME time ago we presented the problem of a motorist who had stalled his car on a level grade with a dead battery and no hand crank. Several readers have pointed out that the solution offered by one reader (jack up the car, put it in gear and turn the rear wheels with a lug wrench) is a bit risky as the wrench may fly out as the motor starts. Mr. John Bochonok of Chicago suggests that a rope be wound around the wheel hub and pulled as in starting an outboard motor. Another alternative offered by a reader would be to jack up the car, build an incline under the rear wheels and roll it off.

REAR END HUMMING was cured by reader H. B. L. by strapping a block of lead to the rear axle housing. The added weight dampened vibration.

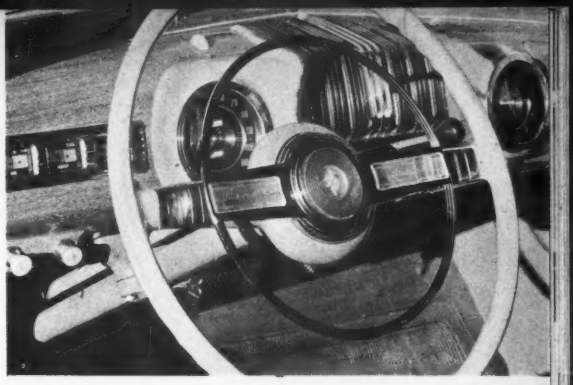
BRAKE INSPECTION should always include pulling back the rubber caps which cover the cylinder ends. You aren't disturbing any fluid seal when you move these boots. They merely act as dust shields.



Front wheel shimmy is sometimes due to rear trouble. Weak springs will increase caster excessively while a whipping propeller shaft will upset front wheel movement.

Springtime service includes tightening of all nuts. Cylinder head should be tightened as per manufacturer's instructions with a torque wrench.

The front wheels should be pointing straight ahead when the spokes of the steering wheel are horizontal. If this is not so the wheel should be adjusted.



BY FREDERICK C. RUSSELL

Pinging and poor acceleration is often due to faulty vacuum spark control. Check for leaky diaphragm or carbon-clogged suction tube.

How body workers straighten out-of-line doors. Block of wood forms fulcrum with pressure applied to another part of door.

BEHIND THE WHEEL

With Fred Russell

If you want a personal reply from Mr. Russell please include a self-addressed stamped envelope.

I have a 1941 Plymouth. The rear cylinder does not function at low speed but will cut in at high speed. I have installed new valve springs, a new head gasket and spark plugs have been replaced. What's wrong? J. A. Richards, Port Lambton, Ont.

Low speed skip can be due to poor compression. Another possibility is leakage in the wire to that plug or maybe the terminal of the wire is not set properly in the distributor cap.

The fuel gauge in my 1932 Ford is out of order. Can you tell me how to fix it? L. L. Roberts, Bremerton, Wash.

We are forwarding to you directions for servicing the gasoline gauge on your car.

What causes lumps of ice to form in my crankcase? Peter Rinaldi, Torrington, Conn.

Water may get into the crankcase via condensation or excessive blowby at the piston rings. Check the crankcase ventilating system carefully. Considerable odor from the crankcase breather or oil filler pipe usually means excessive diluent in the crankcase. Some of this is plain water and will freeze.

What causes my 1939 Ford to shimmy and vibrate at 30 to 40 mph? The front tires will dish out in a few thousand miles. Duncan Roberts.

Shimmy may be due to loose or worn engine mountings. Another possibility is a whipping propeller shaft due to worn universal joints.

Please tell me how I can set the voltage regulator on my 1942 Dodge without using special tools or testing equipment. D. K. Pittman, Plymouth, N. C.

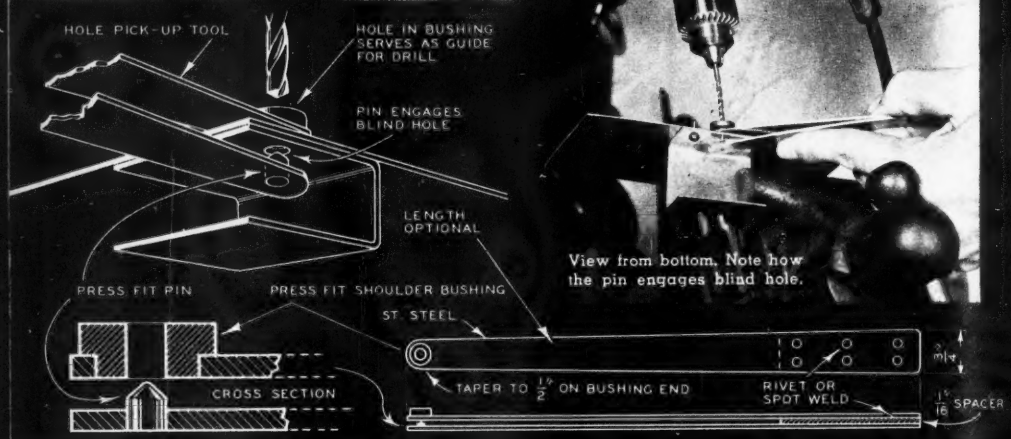
My advice is not to fiddle with the voltage regulator. Many mechanics fail at this even with the necessary equipment.

I'm having trouble with poor gasoline mileage on my 1941 Buick. I only get 12 miles to the gallon. Leo Lawyer, Lawrenceburg, Ind.

Low gas mileage may be due to the carburetors. Try cutting out the rear one. Owners seem to report better mileage and no loss in performance. Buick went back to a single carburetor in the 1946 model which ought to be your tip-off.

shop tips

Always use a drill that will fit bushing snugly as the photo shows.

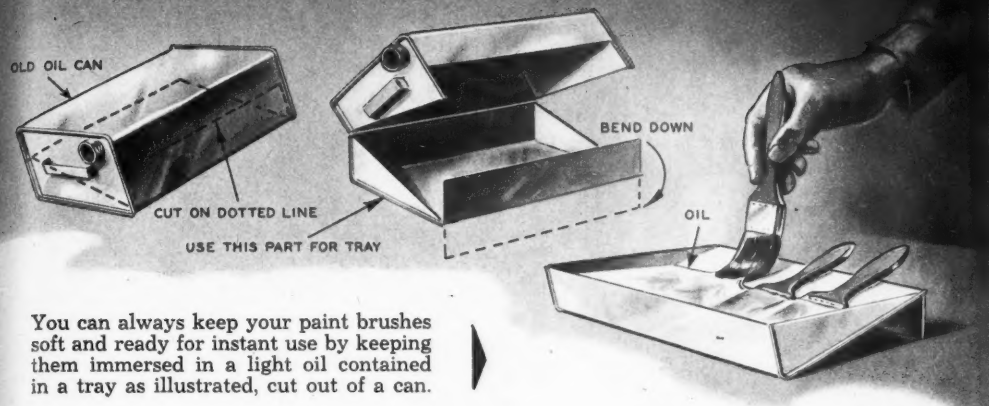


View from bottom. Note how the pin engages blind hole.

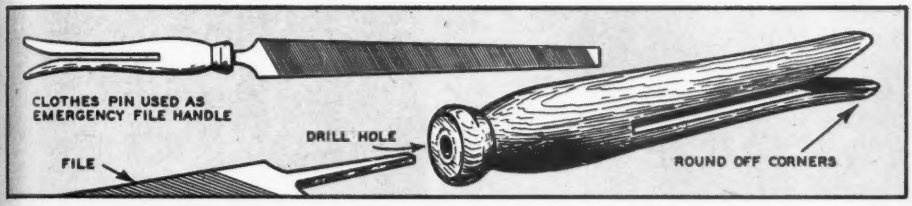
Picking up a hole "blind" can be quite a nuisance as many a mechanic knows. This device enables you to make certain that a hole you are drilling at the top of some work will exactly meet a partially drilled hole at the bottom. Its accuracy depends upon the alignment of the shoulder pin with the bushing on top of tool.

The edges of plywood sheets can be given a rather interesting slightly charred finish by applying the edges to a rapidly rotating emery wheel as in sketch above.

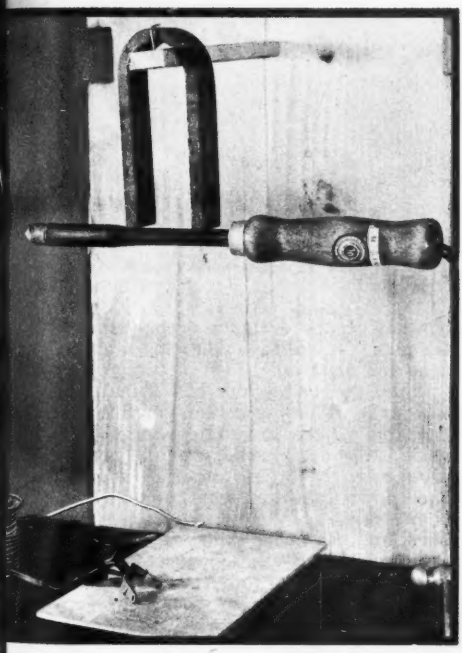
Paper clip placed over scale will prevent you from losing your "place." The bolt head indicates side you are working on.



You can always keep your paint brushes soft and ready for instant use by keeping them immersed in a light oil contained in a tray as illustrated, cut out of a can.

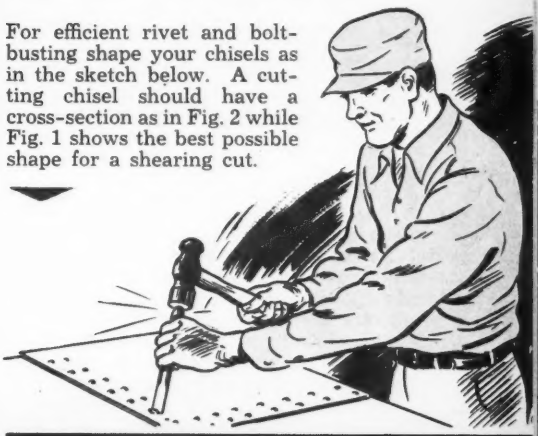


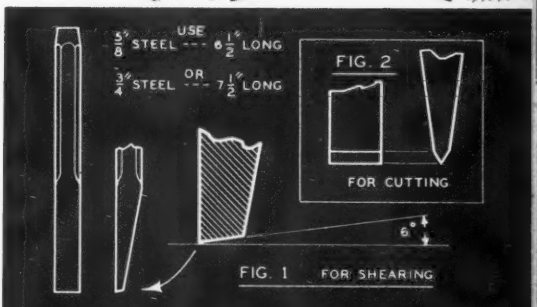
Emergency file handles can be quickly fashioned out of the lowly clothespin. Drill a hole in the head, insert the tang, round off the corners and that's all to it.

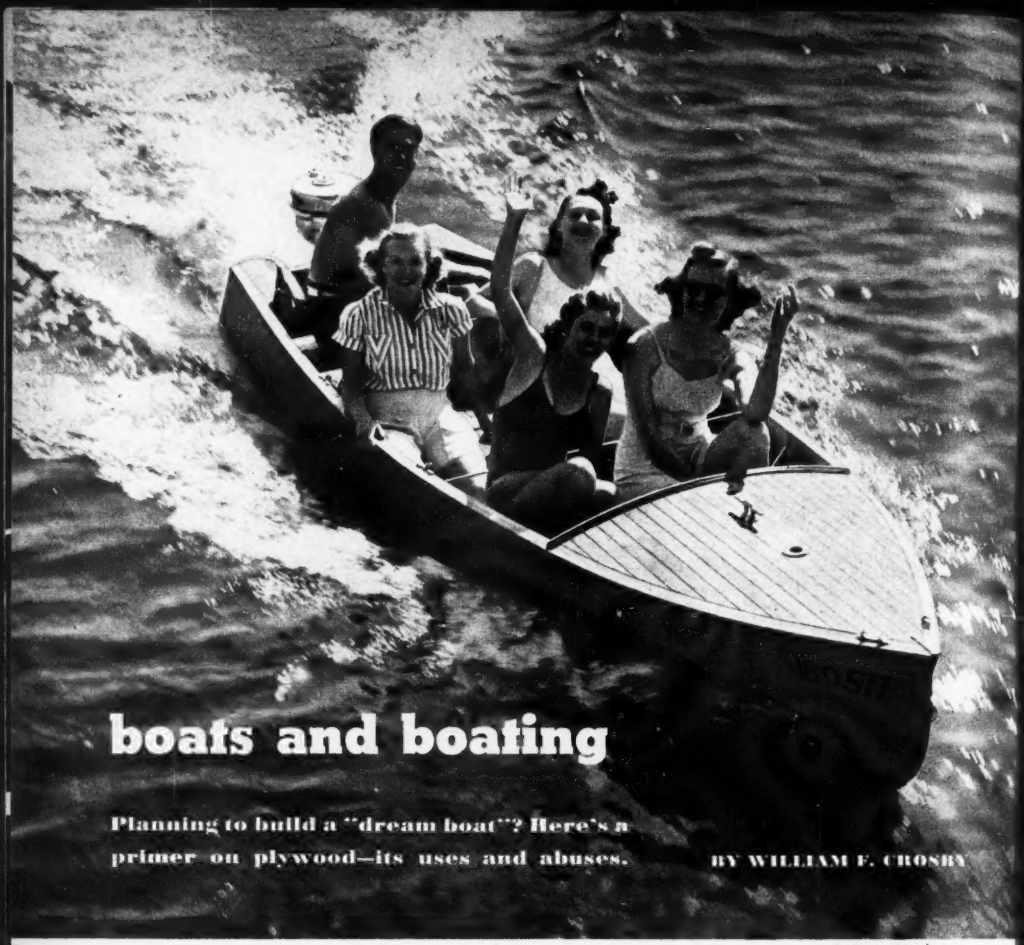


An old horseshoe magnet was pressed into service by one of our readers to suspend his hot soldering iron. The iron is readily accessible and yet kept out of the way of the work. Try it.

For efficient rivet and bolt-busting shape your chisels as in the sketch below. A cutting chisel should have a cross-section as in Fig. 2 while Fig. 1 shows the best possible shape for a shearing cut.







boats and boating

Planning to build a "dream boat"? Here's a primer on plywood—its uses and abuses.

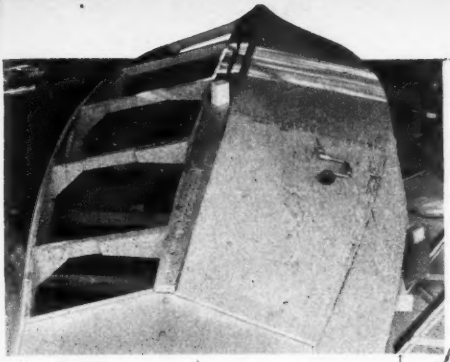
BY WILLIAM F. CROSBY

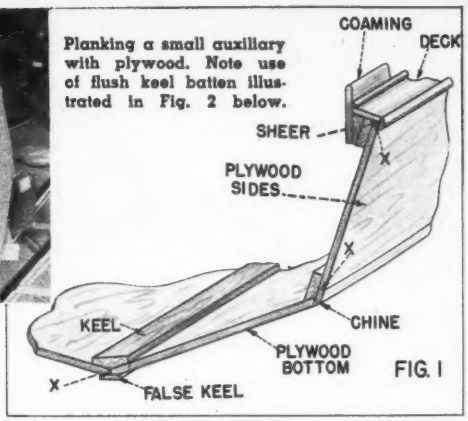
Evinrude Motors Photo

THERE'S never been any question in the minds of both amateur and professional builders about the advantages of waterproof plywood over other materials for small boat construction. The only rub in recent years has been the difficulty of getting the plywood. Now that increasing quantities of it are reaching the market and more boating fans are planning to build the boat they had on paper all during the war, some practical advice on using plywood would seem to be of timely interest.

The most important fact to keep in mind when you're working with this material is that you can't use it to plank all hull shapes. In general, it's ideal for most v-bottom or flat-bottom boats but it can't be used to plank a round-bottom hull because it won't bend around compound curves. If you've already selected a design and aren't sure whether or not you can use plywood to build it, play safe and check with the designer or publisher of the plans. It will save you a lot of wasted time and material.

When you bring your bill of materials to your local lumber dealer, you'll find he probably stocks several grades of plywood. Most dealers carry regular interior plywood, a "weather proof" grade and one known as "water proof" or by a trade name such as Weldwood, Super-Harbord, etc. As far as the first two grades, the interior and weather proof ones, are concerned you can forget about them for boat building purposes because they're absolutely useless. As soon as either of them is exposed to dampness or water, the glue between the plies begins to get soft and in a short time they separate completely. So if you want to avoid this trouble and the chance of having your boat in several pieces by the end of a few months, be sure to specify and use only the "water proof" grades.



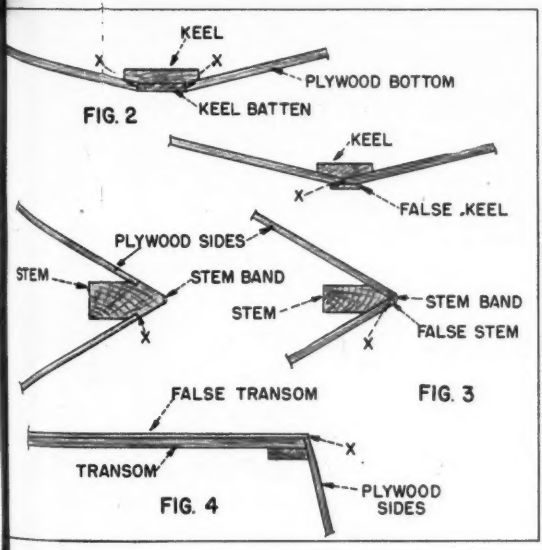


Planking a small auxiliary with plywood. Note use of flush keel batten illustrated in Fig. 2 below.

The thickness of material you use is also important. On most small boats, plywoods from ¼ to ⅜ in. thick (except in the case of light decking on canoes and sports craft) are specified and will prove entirely satisfactory. If the boat is to be used in rough water or for heavy service, you'd do well to use the thicker material because the ¼ in. sheet is apt to be a little brittle and may have a few holes punched in it. Thicknesses over ⅜ in. are difficult to work with for planking unless you're a professional builder. Even the boys in that league prefer to use several layers of thinner stock with a coating of marine glue laid between the two layers of plywood, and the sheets staggered so that the seams and butts are widely separated. The screws are also staggered between the frames so they'll act as clamps, and fastened from the inside of the planking. With this method, you can get a hull that won't leak a drop and will have seams that require nothing more than a little seam composition twice a year.

Regardless of the thickness of material you use, there are certain forms of construction that should be followed for the best results. Like everything else, even waterproof marine plywood has its weak point and that is along the edge of the sheet. The plies on exposed edges may separate even with resin bonding, unless they are protected. Another reason for guarding the edges is that once damaged the outer veneer will check and break off leaving a ragged area that must be repaired. These danger points in plywood construction are illustrated in Fig. 1, a typical section through a v-bottom hull. All the points marked "x" have an end grain that should be covered. In this construction you'll notice this has been accomplished by butting other members against them or using filler strips. For example, the deck has one edge covered by the coaming and the other by the sheer molding. The side planking in turn is covered by the deck and at the lower edge by a chine piece which is installed after the boat is planked. The plywood planking at the keel, stem and transom is similarly protected and in Figs. 2, 3 and 4 you'll see the details of the construction at these points. All seams should of course, be liberally coated with a marine glue and fastened with bronze screws.

Alternate methods of protecting plywood edges at keel, stem and transom.



MI FLEETSTER

BY WILLIAM WINTER

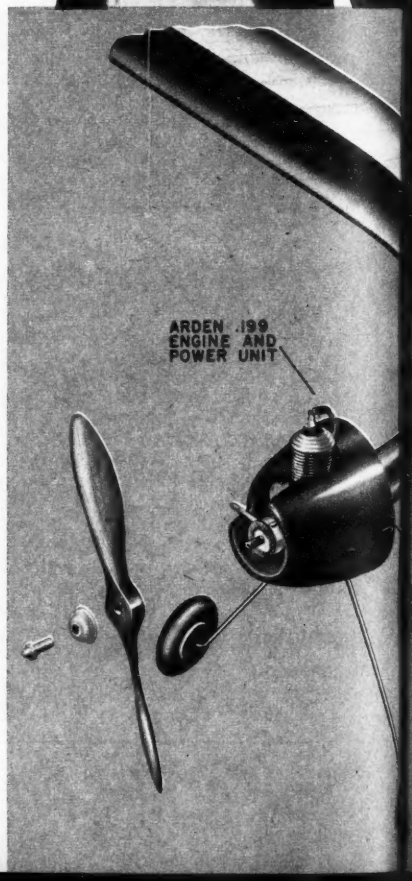
The author, well known to all modelers for his many books on models (The Model Aircraft Handbook, Bill Winter's Model Plan Book, etc.) holding the MI Fleetster.

A class A free-flight gas model that can be converted into a control-line trainer in one minute!

THE MI Fleetster was designed especially for those hard-to-please modelers who demand both realism and spectacular performance. Developed for class A free-flight contest work, the model also doubles as a control-line trainer, with an external control mechanism that can be instantly added or removed. Thus, when you can't conveniently go to your favorite free-flight site (and with the Fleetster you'll need s-p-a-c-e) you can wander over to the local ball field or tennis court and fly control-line!

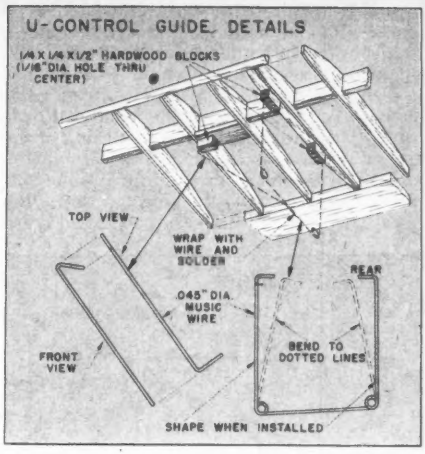
Built around the handy Arden power unit, consisting of the .199 displacement Arden engine, with plastic case for its coil, batteries, timer and condenser, and complete with pneumatic-tired landing gear, this little cabin job features streamlining and simple construction. Details are also included for those who do not have a power unit or desire to install a regular beam mount engine. The original model is fairly large for a class A job, which was necessary to take full advantage of the Arden's power. Because of the large wing area, the model also can be used for class B competition when the Ohlsson 23 engine is installed.

For the technical minded free-flight enthusiast we'll explain some of the more important but hidden features. As we all well know, the torque of a propeller turned by a powerful engine can be hard to handle. On a model of the Fleetster type, this torque force is apt to depress the left wing tip in flight, while under maximum power, and the result is often a spiral power dive. To help offset this disturbing force, we have used offset thrust to the right. This feature is incorporated into the model by means of the plywood firewall which, as seen on the top view, is slanted slightly toward the right side of the airplane. The rudder surface has been given a slight airfoil section; the curvature of this section, being toward the left side of the model, tends to make the model turn to the right. By the use of more incidence than usual in both wing and tail, we have "built-in downthrust," an antidote for bad power stalls.

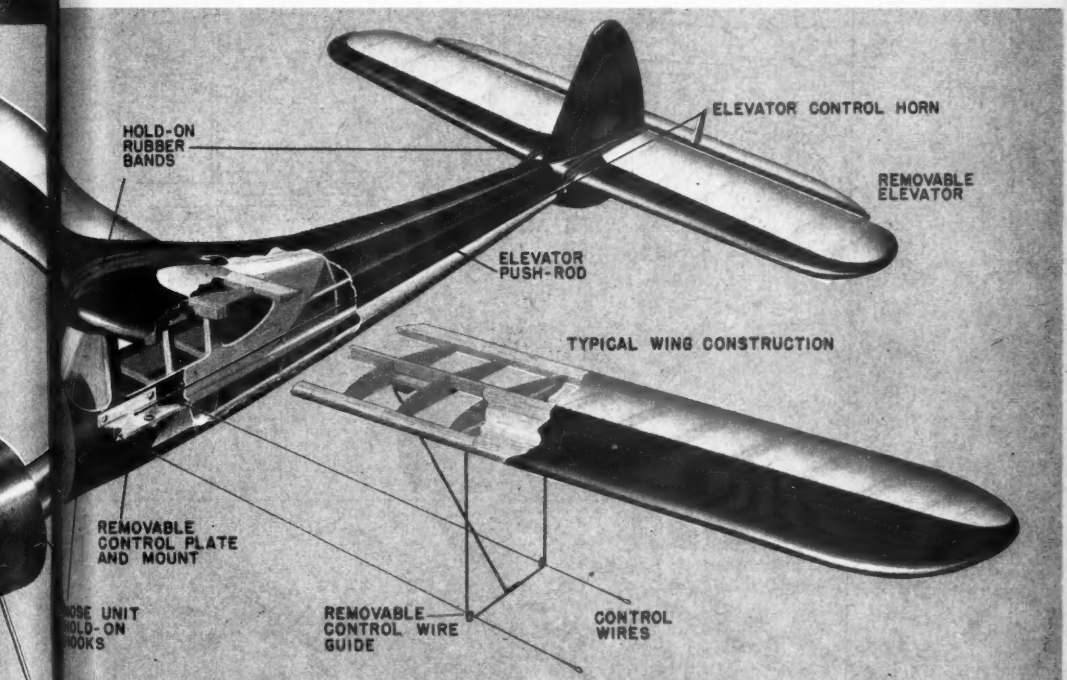


In all probability you will find that you will need more right rudder if you let the engine rev up. The adjustments provided are minimum, since models of identical design vary in the hands of different builders. It is desirable to use a little "wash-in" in the right wing tip to keep it from being depressed too far in right power turns. This can be achieved by holding the wing tip while the dope is still wet, so that it dries with the proper upward deflection of the leading edge at the tip.

The fuselage is built from a "crutch," which is assembled from two pieces of 1/8 x 1/4 in. balsa. Note that there are no cross pieces to this crutch at stations No. 1 and 2. Cross pieces at stations No. 3 and 4 are 1/8 x 1/4 in.; all other cross pieces are 1/16 x 1/4 in. stock. The procedure is to put in place the top halves of all the bulkheads or formers, then the 1/8 in. cabin top or wing support, followed by the 1/16 in. sheet balsa cabin sides and the 1/16 x 1/4 in. top stringers. Afterwards the upper half of the fuselage is removed from the plan, then inverted while the bottom halves of the formers are glued in place, followed by the remaining stringers. If the top half of the fuselage is

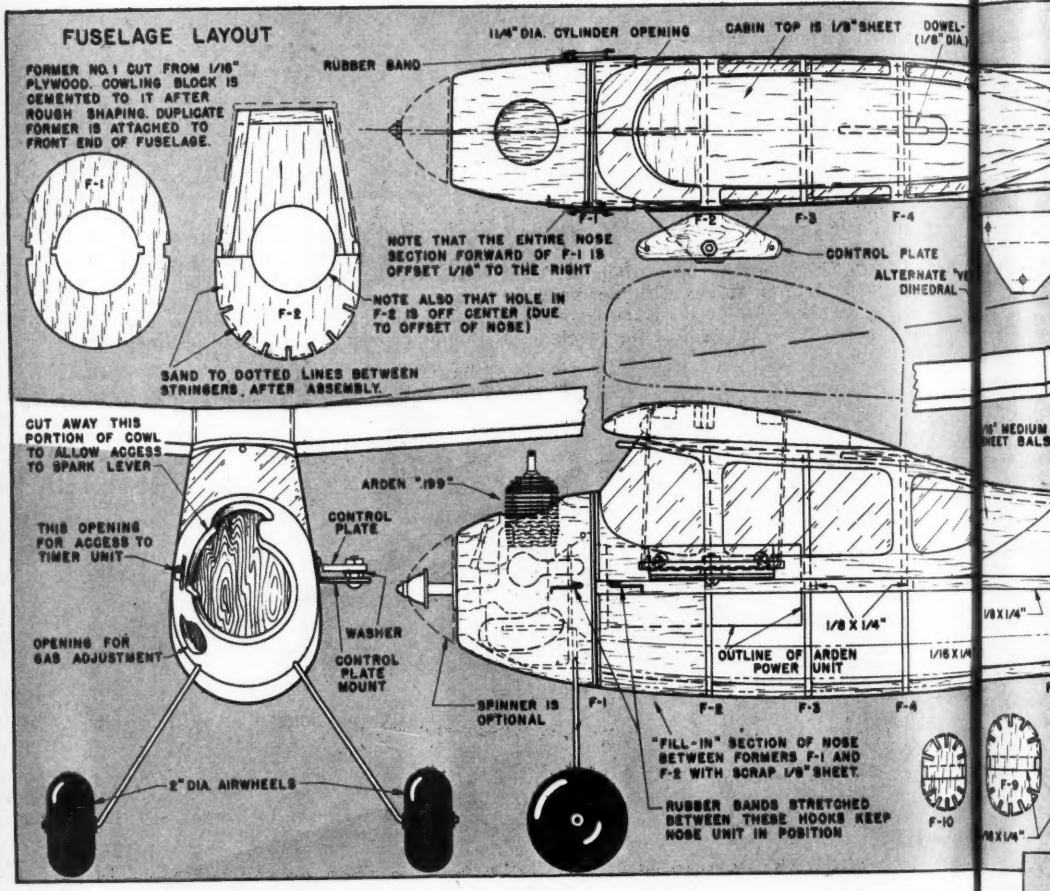


assembled with the first station flush with the end of the bench, it will be easy to glue to firewall in position. The firewall can hang over the edge of the bench. The top halves of formers No. 2, 3 and 4 are assembled over the bulkhead outlines. Each

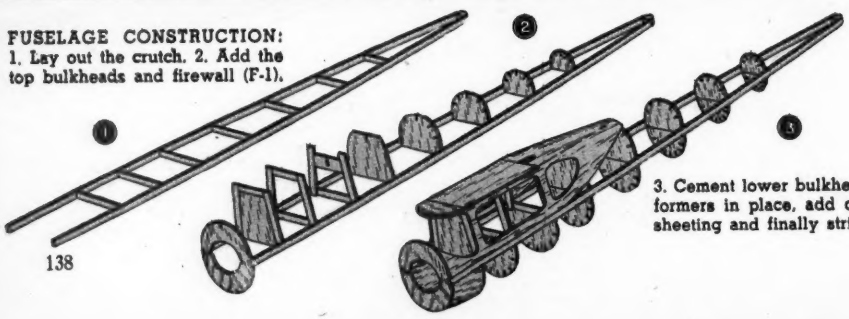


The above cutaway drawing, by Calhoun S. Smith, illustrates the simple yet sturdy construction of the MI Fleetster. Elevators and external control system are removable for free-flight flying.

is made up of three pieces of ⅛ x ¼ in. stock filled in with ⅛ in. soft sheet balsa with the grain running perpendicular. It is important to cut away slight scallops between the stringers, after the fuselage is completed, as shown on the bulkhead outlines. This prevents undue wrinkling of the paper when it is applied. The cabin windows are cut out after assembly. Make stiff paper templates and then cut out the celluloid. The original model has a shaped balsa nose block, but this can be dispensed with, if so desired. If the block is made, blank it out to the exact outlines shown on the top and side views. It may be advisable to allow yourself from 1/16 to ⅛ in. for final sanding. Since the apertures for this particular motor are fairly complex, it is advisable to drill holes to mark their locations while the block is still unshaped. A drill press will insure accuracy so that the timer arm, spark advance arm, throttle arm, and gas



FUSELAGE CONSTRUCTION:
1. Lay out the crutch. 2. Add the top bulkheads and firewall (F-1).

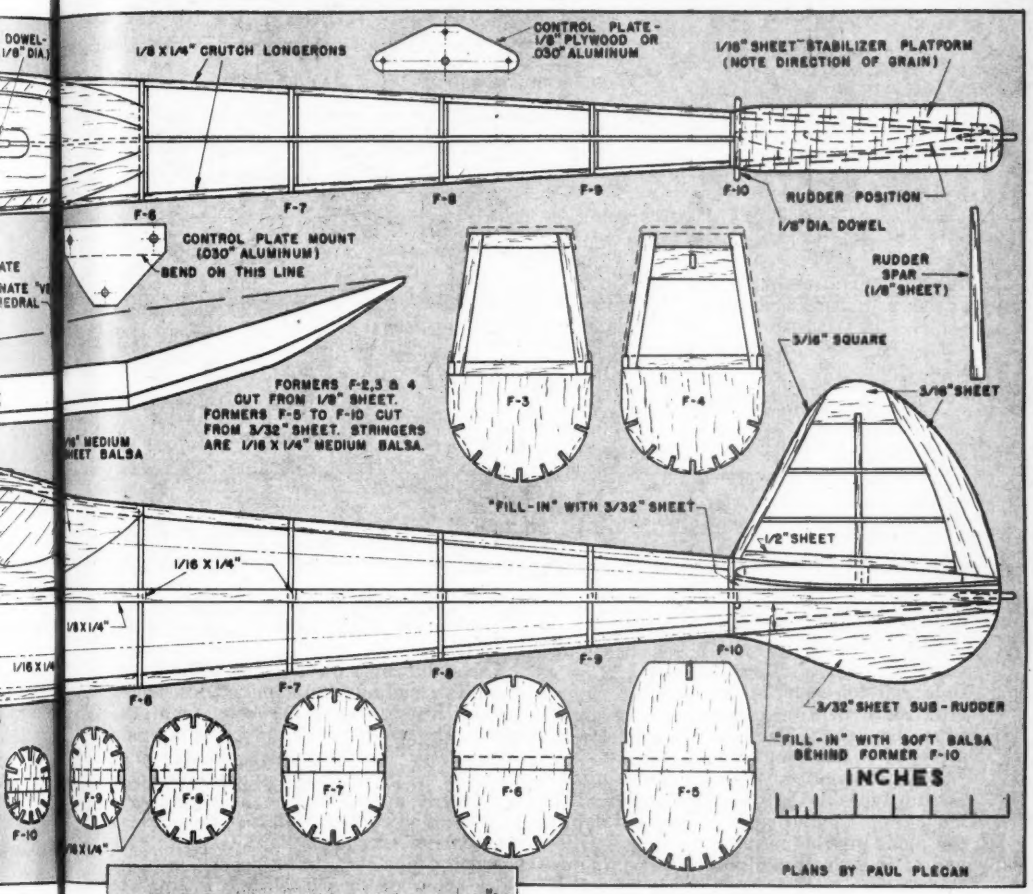


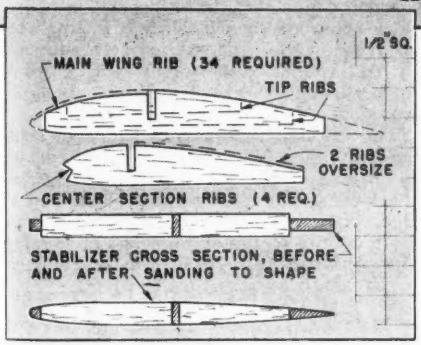
3. Cement lower bulkheads or formers in place, add cockpit sheeting and finally stringers.

tank can be got at conveniently. The stabilizer platform is cut from 1/16 in. sheet, which is glued to the top of the crutch. Note the installation of the 1/8 in. dowels for the wing and tail hold-on rubbers.

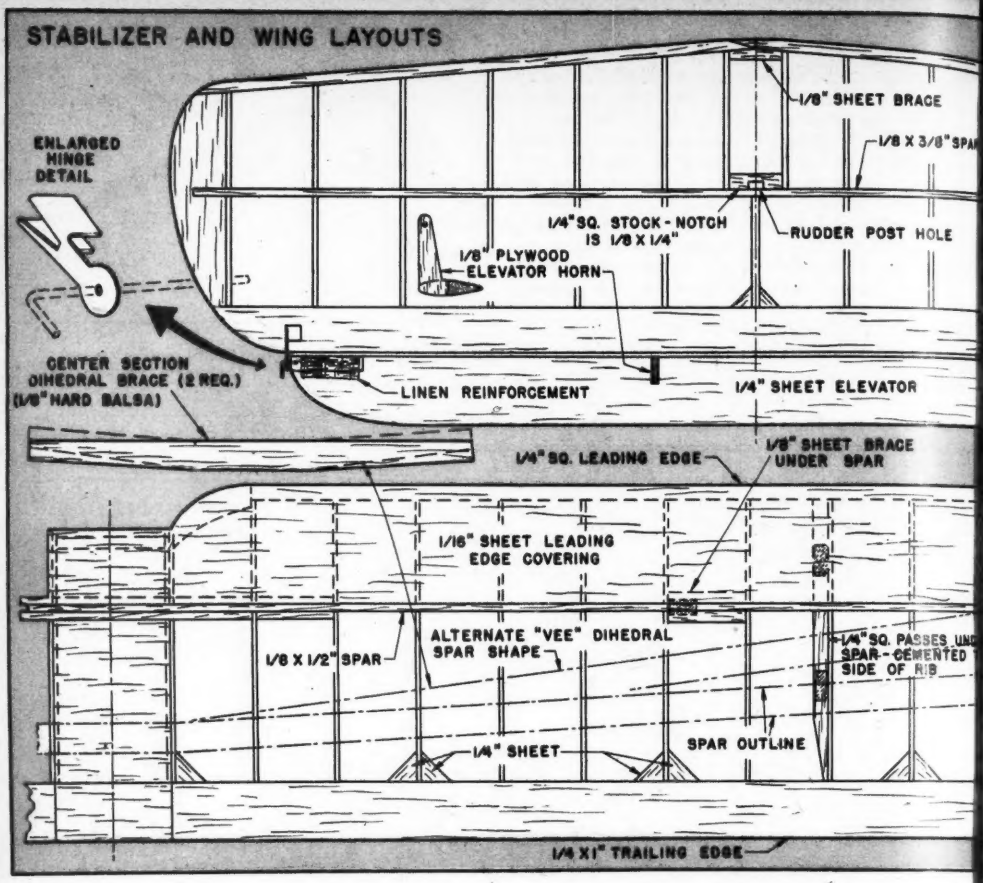
The wing is conventional in that the leading and trailing edges are fastened to the bench, after which the ribs are glued in place. When dry, the top spar is cemented into the notches on top of the ribs. The 1/4 in. square leading edge is pinned down on

The external control-line equipment is easily attached to the fuselage.





top of thin slivers of sheet balsa, which keep it the proper height from the bench. The 1/4 x 1 in. trailing edge may be triangular stock purchased from the hobby shop, or it may be shaped after assembly with a small plane or knife. The ribs are cut from 1/16 in. sheet balsa and are pinned together in one bundle to have their contours sanded to an identical shape. The notches for the 1/4 x 1/2 in. spar are cut at

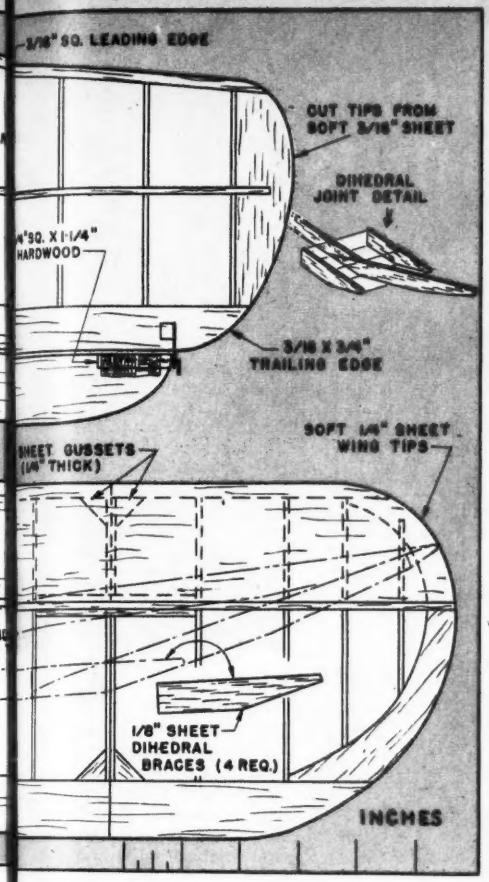


this point. Note that the forward part of the ribs have their top surface cut away 1/16 in. for the sheet-balsa covered leading edge section. This sheet is applied in sections, one for each flat portion of the wing, after the structure is finished and removed from the bench. The tips are made from pieces of 1/4 in. sheet balsa.

It will be noticed that the choice of dihedral types is left to the builder. The model in the pictures has Vee dihedral, but the plans provide measurements for polyhedral as well. While polyhedral may detract from appearance, it tends to roll a model upright if it gets on its back. The wing can be built in one piece, in which case triangular slivers will have to be cut in the spar and edges at the dihedral breaks. If preferred, separate panels may be built and joined together. This requires double ribs, because there must be a rib at the joining end of each panel. In either case, sturdy spar joiners of 1/8 x 1/2 in. hard sheet balsa, box each spar joint where the dihedral break occurs. Further stiffening is provided by 1/4 in. sheet gussets, as shown on the wing plan. Support the wing by blocks to achieve the proper dihedral angle.

The stabilizer is built very much like the wing. The leading edge is pinned down over wood slivers to raise it 1/8 in. from the bench. The trailing edge of 3/16 x 3/4 in. stock is similarly fastened down. Rectangular pieces of 3/32 in. sheet are glued in place as ribs; these are sanded to a symmetrical cross-section after the tail is removed from the bench. The spar is hard 1/8 in. x 3/8 in. balsa, the tips soft 3/16 in. sheet. Note the block of 1/4 in. thick balsa that is glued to the front of the spar to provide a support for the rudder post, which will extend down through the special 1/8 x 1/4 in. hole provided.

The rudder is assembled flat on the bench, with 1/8 x 1/4 in. stock for the spar, 3/16 in. square for the leading edge, 3/16 in. sheet balsa for the trailing edge, and a piece of 1/2 in. stock shaped to match the top contours of the stabilizer. The rudder tapers in thickness, from 1/2 in. at the base

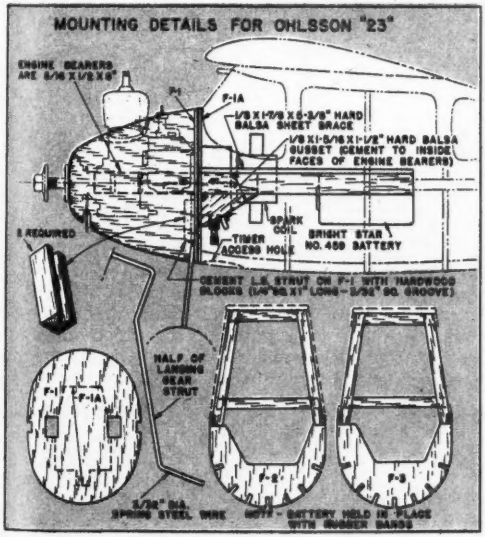


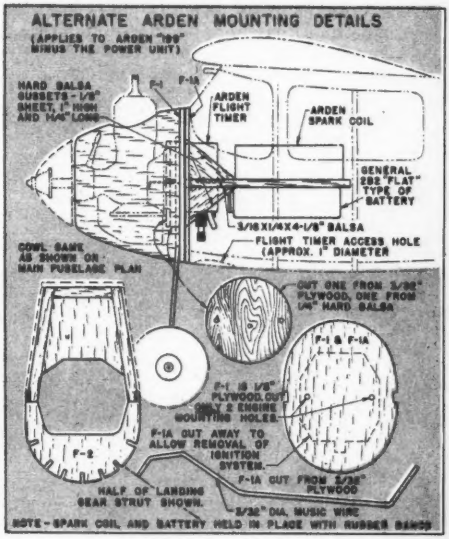
Arden ignition unit is easily installed in nose and removable to replace batteries and to set timer.

rib to ¼ in. at the tip. After covering, it is glued permanently to the stabilizer; this should be done lightly at first, just in case the builder may want to offset it after the first test flights.

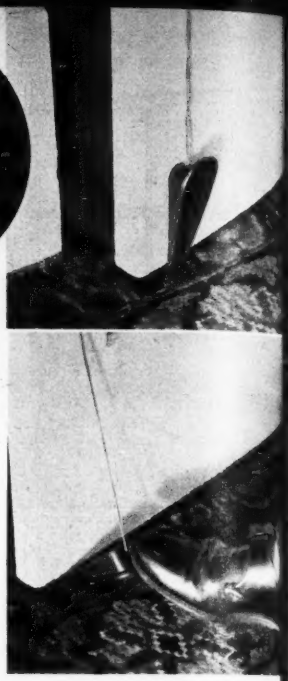
Silkspan should be used for covering. This material, incidentally, is the same as is used for tea bags, may be applied wet or dry. If the first, it is dipped in water before being doped to the structure. If it is applied dry, the finished covering should be sprayed lightly with water. When the water dries the [*Continued on page* 160]

FULL SIZE PLANS—page 153

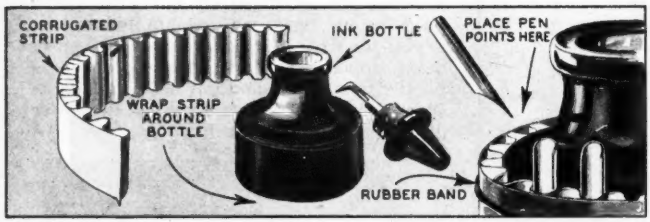




HOME HINTS

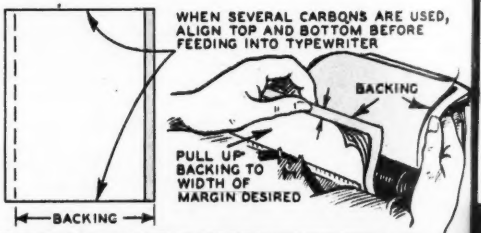


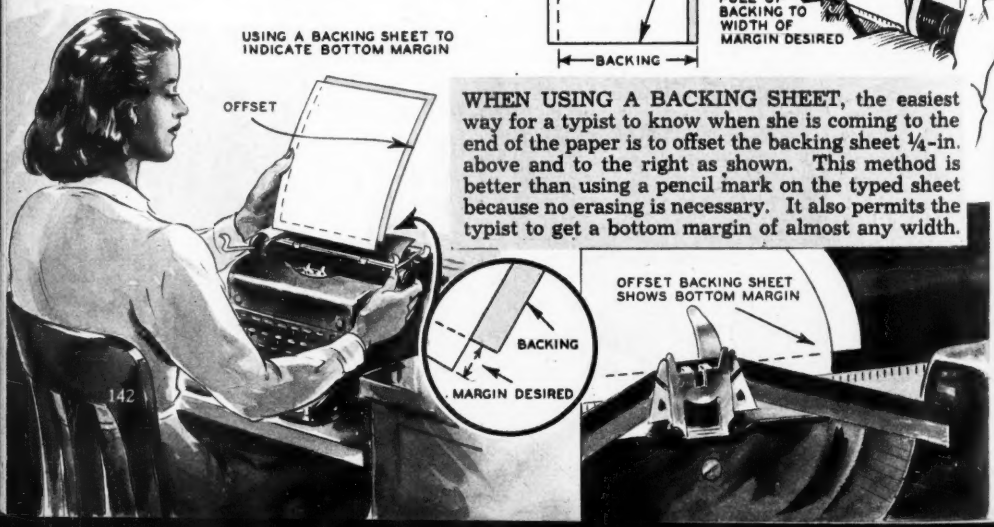
SELECTING EARRINGS when milady steps out is a lot easier if she slips the trinkets over a rattail comb. This saves much valuable time that might be spent hunting the pieces in a jewel box or dresser.



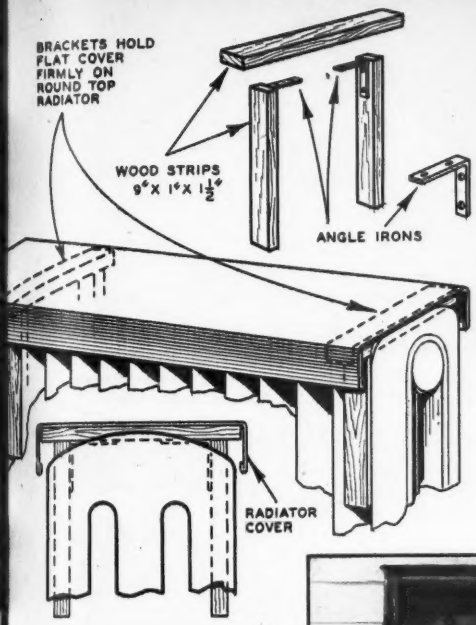
A DOOR STOP that wanders all over the house can be kept where it's needed by attaching it to the door with two rubber bands. You can also operate stop without stooping.

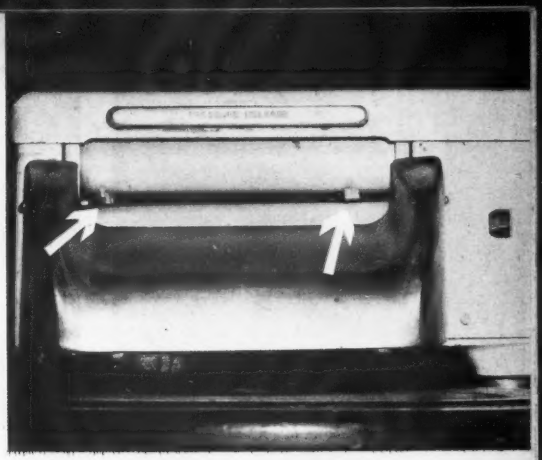
ARTIST'S PEN POINTS that are usually somewhere on the floor, will be conveniently at hand if they're inserted in the grooves of a corrugated cardboard strip wrapped around the ink bottle. This also prevents damaging the pens.





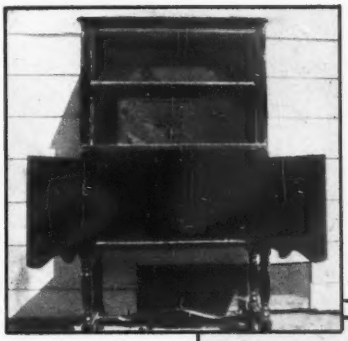
WHEN USING A BACKING SHEET, the easiest way for a typist to know when she is coming to the end of the paper is to offset the backing sheet ¼-in. above and to the right as shown. This method is better than using a pencil mark on the typed sheet because no erasing is necessary. It also permits the typist to get a bottom margin of almost any width.



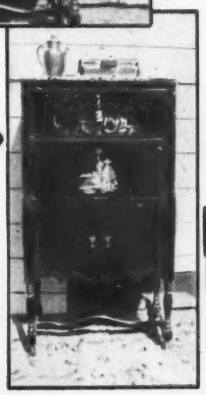


THE WRINGER ROLLS on your washing machine will last much longer if you ease the pressure on them with pieces of clothespin when the machine is idle. This prevents the rolls from being sprung.

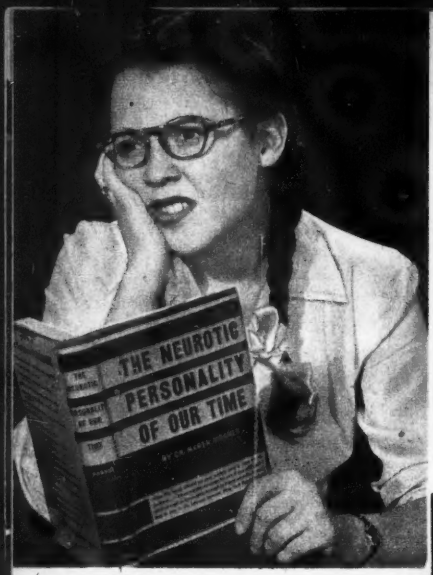
FLAT COVERS won't rock on round-top radiators if you use these U-shaped wooden brackets. Made of scrap wood and angle irons to fit between the sections, they'll anchor your covers and keep them from falling to the floor.



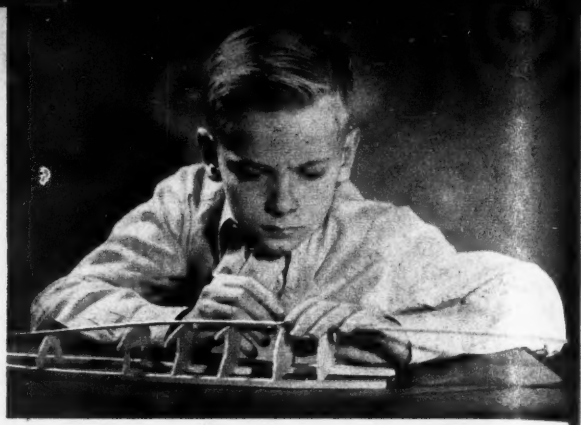
A HANDY CELLARET with space for all the "mixins" can be made from an old radio cabinet of pre-war vintage. The space inside should then be fitted with shelves.



STAINED WATCH STRAPS can be avoided by lining the inside of the leather with waterproof adhesive tape as shown in the photo. Don't let the tape extend beyond the edge and replace it frequently.



$5.00 Award .....Could Be
Robert J. Metz of New York City rather whimsically portrays a dilemma of the younger generation.



$5.00 Award .....Doing Big Things
Graflexed on Portrait Pan by A. R. Birkens, Bronxville, N. Y.

$5.00 Award .....The Road Home
A time exposure, 7 minutes at f-11 taken by one of our overseas readers, Alfred Heden, Insjon, Sweden.

Photo Contest

MONTHLY PHOTO CONTEST RULES

Please put your name, address and picture-taking data on back of each print. Wrap with cardboard stiffeners and enclose a self-addressed stamped envelope for return of unused photos. Prize-winning pictures are not returned. Judges are MI Editors. Duplicate prizes awarded in case of tie. Photo Contest Editor, MECHANIX ILLUSTRATED, 67 West 44th Street, New York 18, N. Y.

1st Prize ($10.00) ....."Yer Out!"
George F. Marks of Edmonton, Canada, captured the monk with a Rolleiflex, on Ansco Superpan film, 1/50th, f-11.

A DARKROOM AGITATOR

With this handy gadget you can sit back and let the water works work for you.

BY GEORGE S. COWLAM

INSTEAD of twiddling your thumbs to agitate the film in your developing tank you can sit back and take it easy, if you get busy and make this simple little darkroom accessory. It is made of three pieces cut from a wooden yardstick or any other ⅛x1 in. stock.

Tools required are a brace and bit, a coping saw and a piece of sandpaper, although in a pinch the whole job can be done with a sharp pen knife and a sandpaper-wrapped lead pencil.

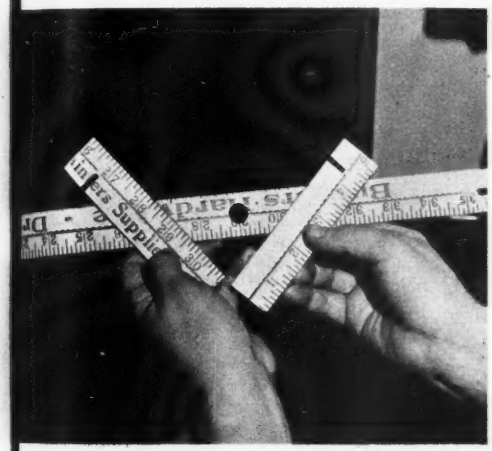
Cut the cross-arm 1½ in. shorter than the inside diameter of the print washer, so that the blades will clear the end of the hose which is fastened to the inside edge of the washer.

Make a slot ⅛ in. wide and 1 in. long in each end of the cross-arm. Then drill a hole in the middle with diameter slightly less than the end of the stirring rod of the developing tank. Ream the hole out with sandpaper until it requires just moderate pressure to force it over the end of the stirring rod. If you get the hole too large, you can correct your mistake by using a paper shim.

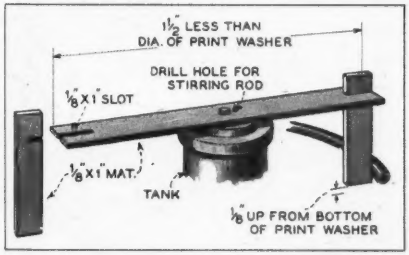
Slot the two blades as shown in the drawing so that they will fit into the ends of the cross-arm. Make sure they clear the bottom of the washing tank. Exact dimensions will depend upon the size of your developing tank and your washer.

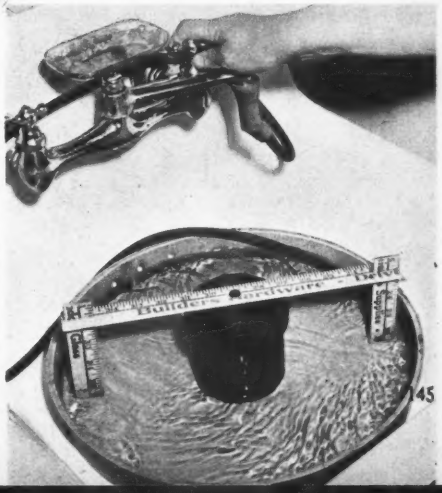
Load the tank and fill with solution in the customary manner, turn the stirring rod by hand for about thirty seconds, then place the tank in the center of the washer, press the cross-arm into place, making certain that it touches the tank at no place other than where it engages the stirring rod, turn on the faucet and go back to your newspaper. The rest of the agitation will be done courtesy of the city water works.

A comparatively low faucet-flow, with pressure jacked up by the nozzle on the end of the hose, will give the film spool a complete revolution in about two seconds; thus the processing time should be that specified for tank rather than for tray.



This particular agitator was cut out of an ordinary yardstick, inch marks plainly show size. Photo at right shows the unit in use.





35 MM. film strips

How would you like to show your pictures not in 8x10's but in a giant 30x40 in. size?

BY DONALD MANASHAW

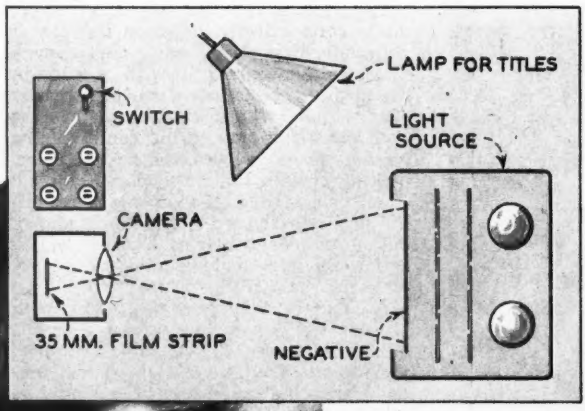
PRESENTING your pictures via a film strip and a slide projector is the next best thing to motion picture. First of all the pictures are big—not a tiny snapshot size or even a modest 8 x 10 enlargement, but a full 30 x 40 in. and even bigger! Secondly, everybody in the audience can see your handiwork at the same time. There is no need to pass pictures around.

The film strip is a continuous strip of 35mm film containing pictures, called frames. The frame may be single—1x¾ in. such as that taken with the Memo, Sept, and all 35mm motion picture cameras. Or it may be double—1x1½ in.—such as that taken with the Leica, Contax, Argus, Kodak 35 and most 35mm still cameras.

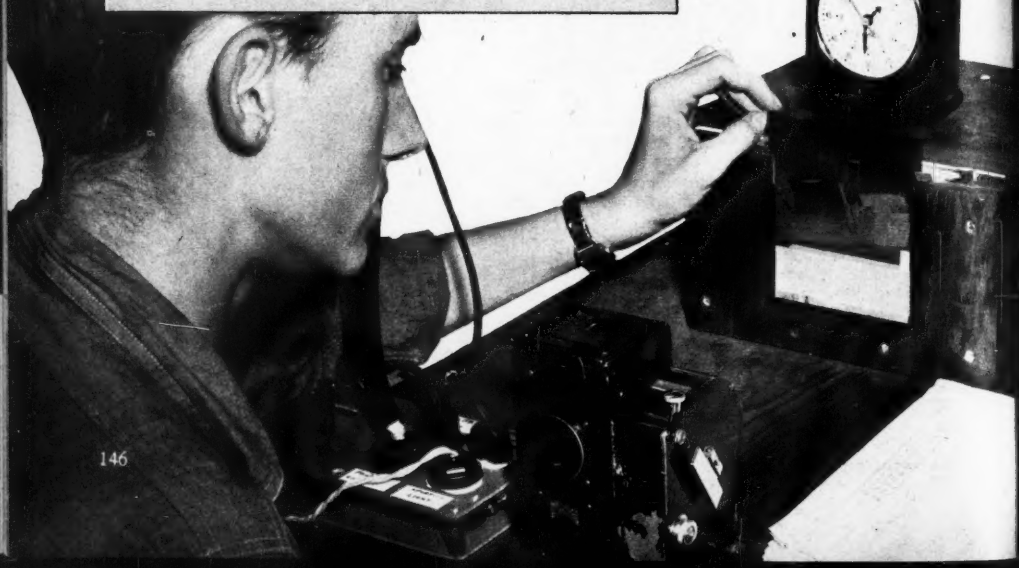
In the method we outline there are just two simple steps: (1) Shoot the original scene with any camera, and (2) copy the negative with a 35mm still camera.

Here is the setup I use. You can think up many refinements and adapt your present equipment to this method. The basic piece of equipment is a 1 in. plywood board, 3x3 ft. on which are mounted the following: (1) A light-tight box with the top hinged so that the box may be opened for the replacement of burned out lamps; (2) a two-way switch with an "off" position; (3) a reflector and lamp for title making.

The box is made to accommodate your own particular negative size. The negative lies flat against a piece of ground



Average exposure, 5 seconds at f-5.6. Clock with second hand is used for all timing.



glass and is kept in place by two pieces of spring steel, one holding each side of the negative. Inside the box are two more sheets of ground glass, and these, together with the outside ground glass serve as an excellent diffusion medium for the two lamps housed inside the box. The lamps are the ordinary 15-watt household bulbs.

The switch, mounted on the board to the front and side of the square box, has two positions plus an "off" position. Turn the switch lever to the left and the negative light goes on (the light inside the box). Turn the lever to the right and the title light goes on, a 50-watt lamp in the reflector directed at the negative.

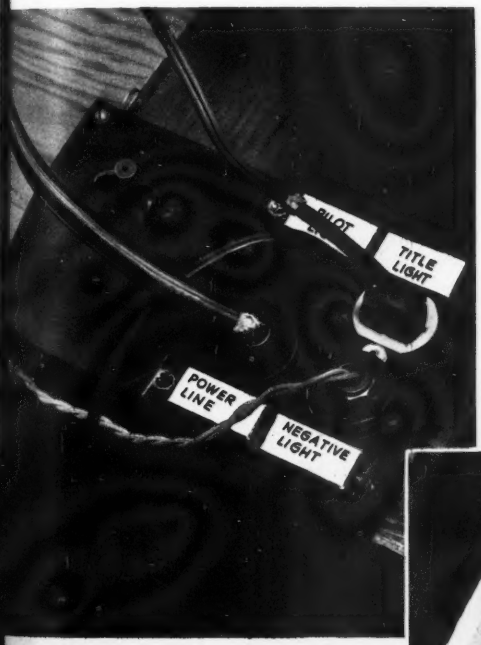
Here is what the title light is all about. In the event you want titles to appear on the screen, before or after a frame, do your lettering on a white card the size of your negative and insert it in the front of the box as you did with the negative. Then put on your title light. The result? A professional title on the screen—white letters on black background.

The 35mm camera I use to shoot my 4x5 negatives is a Sept camera. It has this essential feature—ability to rack out the lens so that it fully covers the negative. Other devices can be used for this purpose, such as the Speed-O-Copy and similar copying attachments. Or, you can use the extension tubes to permit your lens to cover your particular negative size.

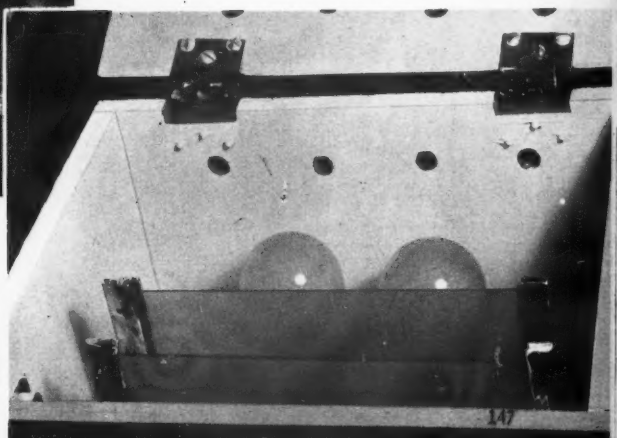
The amount of exposure I give the 35mm film has been determined by trial and error. I use positive film for most work, and high-contrast positive for charts and line drawings. With my Sept lens set at f-5.6 my exposure runs about five seconds for the average negative. A large clock with a sweep second hand rests on top of the box, readily visible for timing. An exposure of five seconds enables me to do local dodging. For more accurate dodging I can stop the lens down to f-8 and prolong the exposure to ten seconds. The dodging can be done with your hand or with small, black irregular-shaped cards.

Your original negative material may be of any emulsion, developed in the usual way. Best results are obtained by a negative that would require No. 2 printing paper. The 35mm positive film can be developed under a red safelight with Eastman D-72 or Ansco 103 developer. A recording can be made and run with the projected film strip with musical background if desired plus narration and sound effects.

Five years ago the film strip was a second cousin to the motion picture. Today it is its twin brother. It lacks the motion and emotion of its brother but has the ability to do a big job in its special way—especially when details are to be left on the screen for a prolonged time, and when a quickly-produced, inexpensive medium is desired.

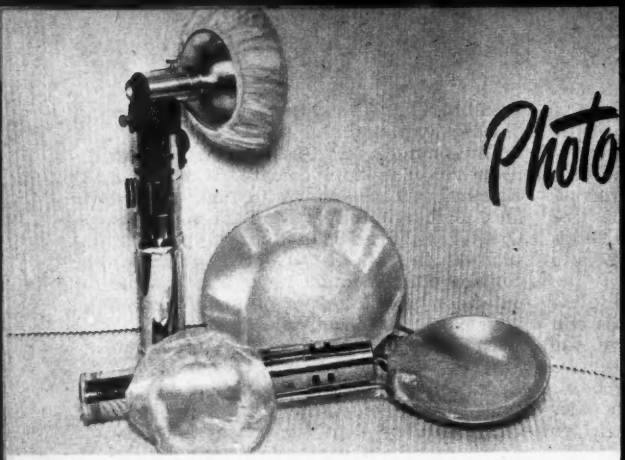


Turning switch to left turns on negative light while pushing it to right turns on the light for making titles.



A view inside of the box showing the two 15-watt frosted lamps and the two strips of ground glass for diffusion.

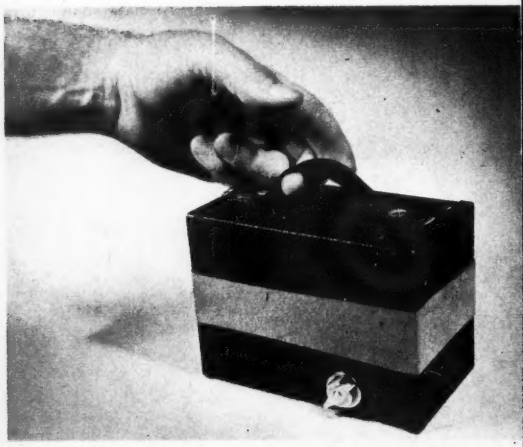
Photo Kinks



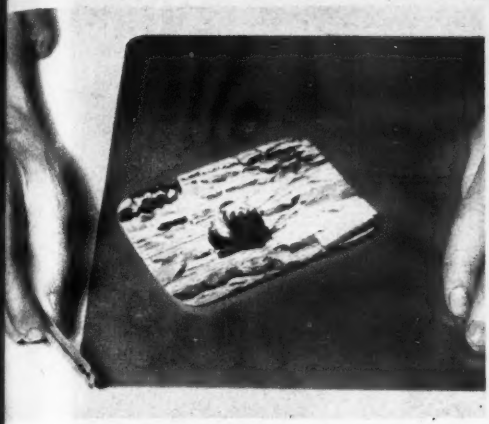
REFLECTOR PROTECTORS. Those bowl covers your wife buys to protect food can be put to another use as one darkroom widow found out. Her husband was using them to protect his flash reflectors.

EASY ON THE DOGS. Your feet will say "well done" if you give them a duckboard to stand on instead of the usual cement darkroom floor. This one was made of a picket fence nailed to strips. Pick it up and air it out occasionally.

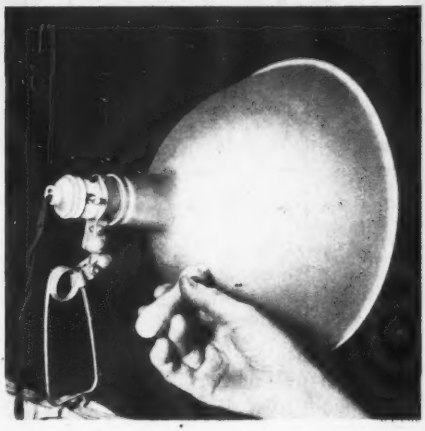
SPANNER WRENCH. Getting that inner ring out when disassembling a lens is a real job unless you have the proper wrench. A piece of hacksaw blade, when cut to size, works nicely.



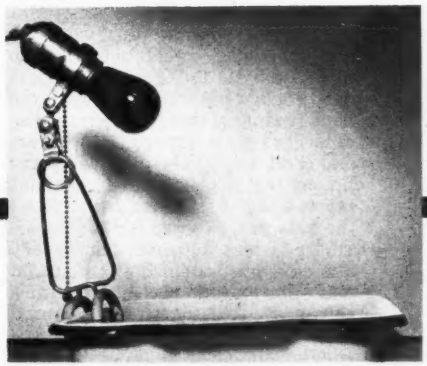
BROWNIE BUMPER. A wide rubber band cut from an old inner tube makes a very useful accessory for the box camera. Snap it over so that it protects lens and shutter from dust and scratches. Don't make the mistake however of neglecting to remove the rubber band before taking your pictures. You can guard against this catastrophe by using an elastic wide enough to cover the shutter release as well as lens. Or, by covering finder lens too.



ROUND 'EM. Getting rid of dog ears on prints and preventing them can be accomplished by using the corner of the ferrotype plate as a cutting guide. Place the plate over the prints and trim the corner with a sharp razor.



HANDY HANDLE. A file handle attached to the reflector bowl by means of a screw makes a convenient handle and will prevent burned fingers when adjusting the light. It also does away with finger marks on the polished surface.



LET THERE BE LIGHT. If you attach your ruby safelight to a clamp-on unit as shown in the photo, you can clip it wherever you want it, right over the tray if the occasion demands it.

QUESTION BOX

Photo fans! Use this column for answers to any of your problems on photography. If the question involves a print fault please include the print with your letter (and postage for its return).

How can I convert my Postcard Kodak into an enlarger? D. M. Seggie, Montreal, Can.

Plans for building enlargers appeared in the May and December 1946 issues of MI. If you'd like to build an enlarger from full-size drawings, send $1.00 to our Greenwich, Conn. office for the Dustmaster Enlarger blueprint.

Can you tell me where I can procure condensers to make the 35mm enlarger described in the December 1946 issue of MI? G. E. Louvris, Pittsburgh, Pa.

Condensers for photo enlarging can be procured from Geo. Murphy, New York City, Burke and James, Chicago, Ill. and the Eastman Kodak Company, Rochester, N. Y.

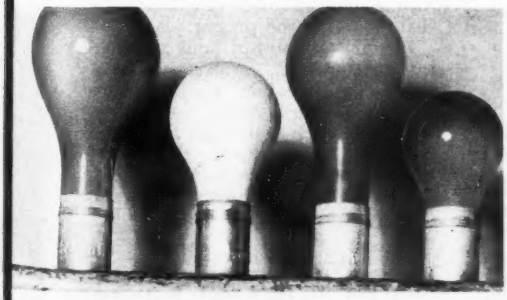
Can you tell me the keeping properties of D-76 developer? R. Hunka, Lethbridge, Alta., Can.

Here are the keeping properties without use:

8x10 tray	24 hours
Gallon tank	1 month
Full, stoppered bottle	6 months
Half full, stoppered bottle	2 months

What is the shutter speed of a Falcon Miniature and a Flash Brownie camera? R. Steinberg, Chicago, Ill.

Both cameras have a shutter speed of about 1/30th of a second.



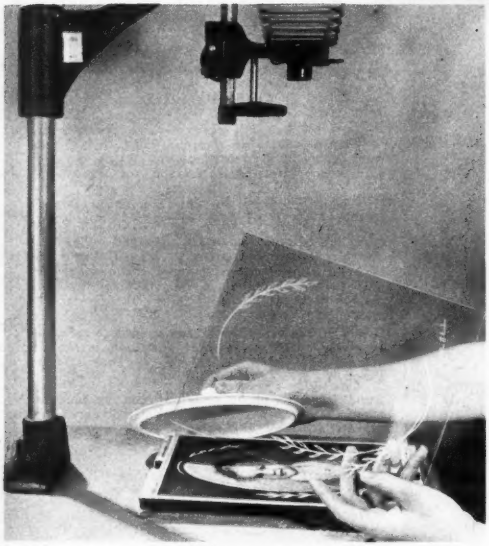
LAMP STANDS. The metal cans in which some manufacturers pack their 35mm film just fit the base of household and photo flood lamps. Nail the bottom to a shelf or bench and your lamps will never roll off.

Something New in Borders

Dish covers in your darkroom make really artistic borders.

I BOUGHT a new type picture frame with the glass held upright in a plastic base and was rather disappointed because it gave such an unframed appearance to the picture. After a little experimenting with borders in my enlarger, I worked out this simple way to dress up my favorite pictures.

In the kitchen cupboard I found some covered china dishes, one oval and one round, which, when set on my 8x10 easel left a generous border. I made my enlargement in the usual manner, then turned out the enlarger light, removed the negative and carrier and carefully placed the lid on the exposed paper without moving the easel. Then I turned on the enlarger, exposed for 25 seconds (more or less, depending on paper) and developed the print in the usual way. The border was black with a soft, gray, two-toned effect caused by the light reflecting under the edge of the lid.



A piece of acetate with a painted design adds variety to the border by giving effect shown at the top of page.

BY WILLIAM J. ERICKSON

For an added artistic touch I painted a design on a sheet of acetate and slipped this into the easel over the paper. Several of these sheets can be made up in various designs to suit the picture. They also serve as a guide in placing the dish cover in the proper place.

If you want to put your name in the dark area of the print, write it in with a soft lead pencil before turning on the light for the border. The developer will wash away the pencil marks and leave your signature white on a black background. Do not use a crayon or grease pencil.

Oval or round covers can be used. You will find the knobs most convenient.

. . . makes your camera steady and light on its feet

Kodak Eye-Level Tripod is light in weight, quick to set up . . . and built to last for years. It gives rigid, dependable support to movie and still cameras and helps you get pictures free from accidental camera movement. Extends from 22½ inches to 60 inches. $16.75 plus tax.

Kodak Turn-Tilt Tripod Head angles your shots expertly

Easier panning with your movie camera, a versatile accessory support for still shots. New smoothness in performance with a minimum of adjustments. Fits your present tripod or *Kodak Eye-Level Tripod.* $13.25 plus tax.

ENLARGING EASEL speeds making of album prints from miniature negatives

Kodak Miniature Enlarging Easel for 2¼x3¼ album prints (with ⅛-inch white margins) from miniature negatives. Makes a rapid succession of record prints from which choice shots may be selected for further enlargement. With its white Tenite base insert, there's no need to use photographic paper while focusing. Two built-in bins hold your papers. It rests on the baseboard of your enlarger. $6 plus tax.

Optipod
$1.50 plus tax

Kodapod
$2 plus tax

These clamp-on "tripods" are convenient and steady

Optipod (left) and *Kodapod* (right) are pocket-size and easy to carry—yet give you tripod steadiness. Optipod is felt-lined, fastens to chairs, tables, desks—*Kodapod's* teeth bite firmly into fences, tree branches, etc.

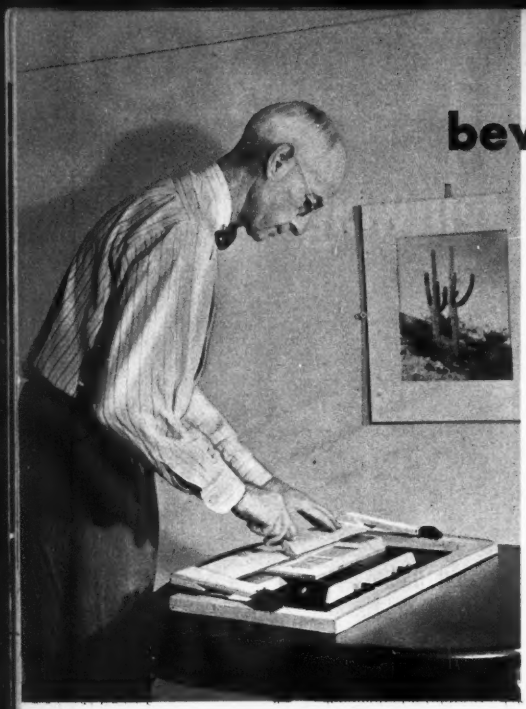
Eastman Kodak Company
Rochester 4, N. Y.

Kodak

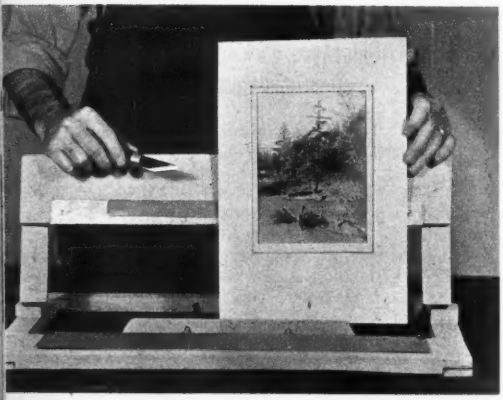
beveled edge mat maker

Now there's no need to envy those beveled edges on professional mounts.

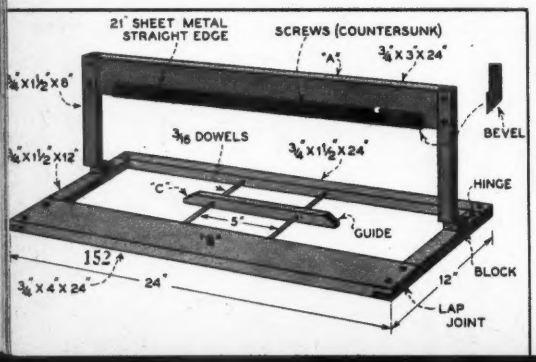
BY E. PETER SMITH



Best method of cutting consists of making several light cuts instead of a single heavy one.



The finished end product. This photograph really does not do justice to the beauty of a beveled mat.



INSTEAD of messing around with adhesives and dry mounting tissue why not mount your favorite photos behind a beveled-edge mat? They'll always stay put and it is just a matter of moments to remove the photo for another one. This particular Mat Maker will cut beveled edges as well as the conventional straight edge.

The wood for construction can be obtained from discarded crates. Get three boards, 24x4x¾ in., 24x3x¾ in., 24x1½x¾ in., two pieces, 8x1½x¾ in. and two pieces, 24x1½x¾ in. From the scrap box of the nearest plumbing shop secure one piece of heavy galvanized iron, 21x1½ in. You will also need 24 in. of $\frac{3}{16}$ dowel rod. A pair of hinges and a piece of ¼ in. boxwood ¾x12 in. complete the material requirements.

The lower, or pressure bed, framework is a rectangle 12x24 in., put together with lap joints and screws. The 4 in. wide board is built into this lower framework, which will form the pressure bed and cutting surface.

The upper U-shaped frame is the pressure plate and has the galvanized iron straight edge attached to it. The 3 in. board forms the front member of this frame when assembled, with the lower 4 in. board, leaving a 1 in. cutting ledge on the inner side of the mount maker.

Before assembling the parts, taper the upper pressure plate and the metal straight edge as shown in the drawing. Drill two $\frac{3}{16}$ holes 5 in. apart in the pressure bed plate and in the opposing back rail for the dowels.

The riser blocks are used in order to hold both plates parallel and exert firm pressure throughout the length of the cutting area. Incidentally a piece of cardboard should be kept on the pressure bed plate to prevent scoring.

A guide, C, is made of soft boxwood drilled to receive the two dowels. It will be found very useful for cutting up paper stock and trimming large prints.

Any thin knife or a single edge razor blade may be used for the actual cutting.

MODEL PLANS
for model fans

★ FEATURE MODEL
MI fleetster
plan no. 376

★ p-47 thunderbolt
plan no. 375

★ mr. mulligan
plan no. 374

★ pylon buster*
plan no. 373

★ piper skysedan
plan no. 372

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The feature model on pages 136-141 of this issue is Bill Winter's **FLEETSTER** (No. 376)—a combination free-flight and control-line model anyone can build. Plans for the other models shown on this page are also available at your hobby shop. If your dealer can't supply you immediately, send 50 cents for each plan to MI Reader Plan Service, Fawcett Publications, Inc., Greenwich, Connecticut.

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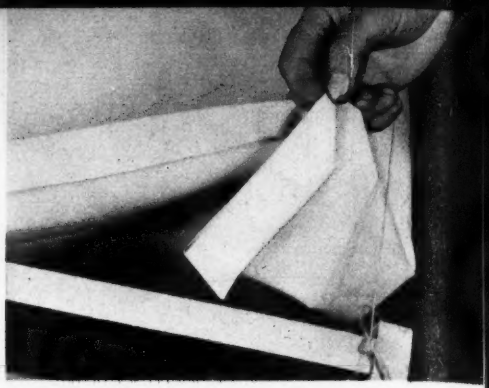
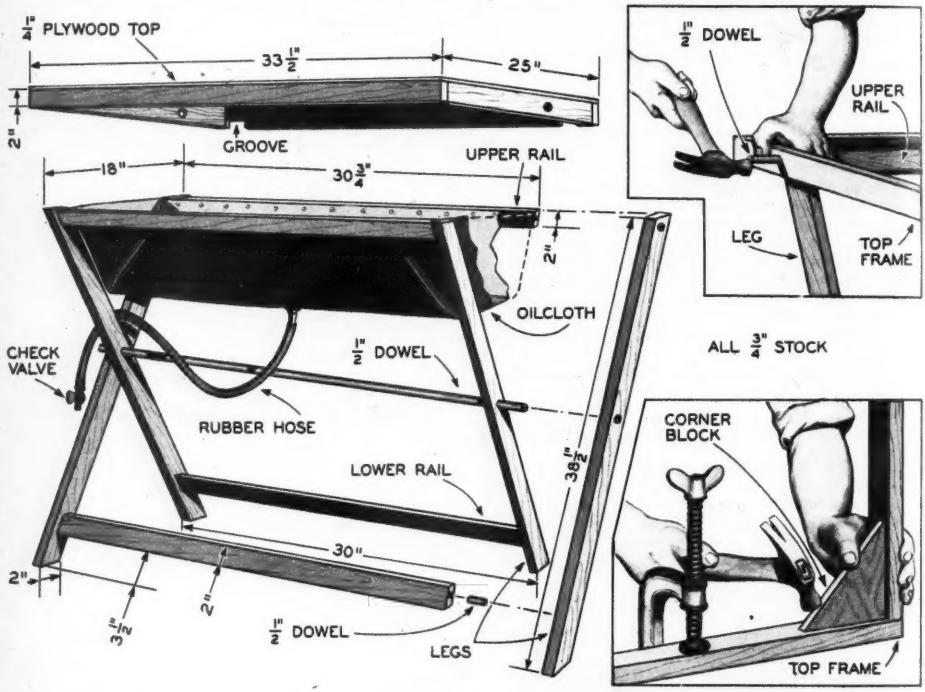
Installing metal plug in bottom of basin. Rubber gaskets are used on either side of material.

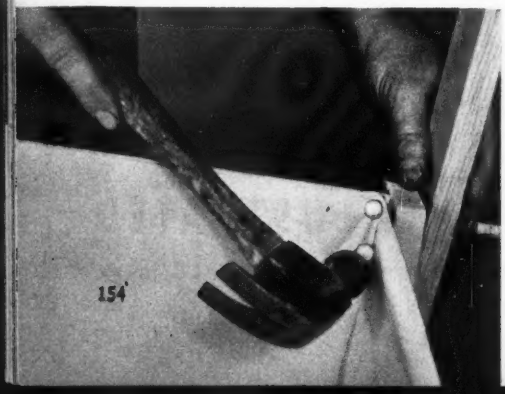


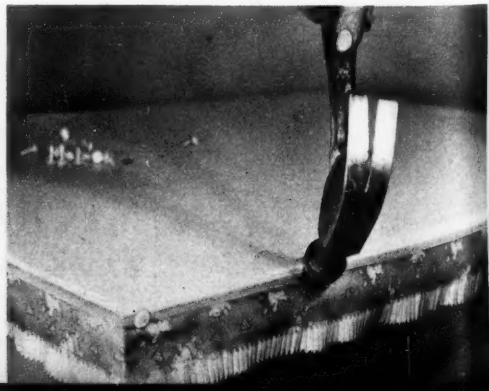
Stitch the oilcloth to frames with linen thread. Note string used to hold frames in correct position.

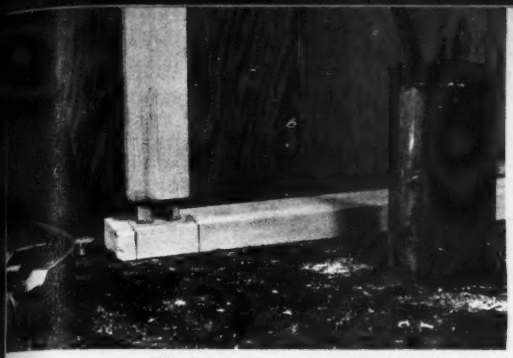


Using smooth-headed tacks to fasten oilcloth to inside of frames. Corners are mitred and folded.

Fancy shelf edging trims off the top which swings back to permit using the basin underneath.







All joints are secured with glue and ½ in. dowels sunk ¾ in. deep in the frames.

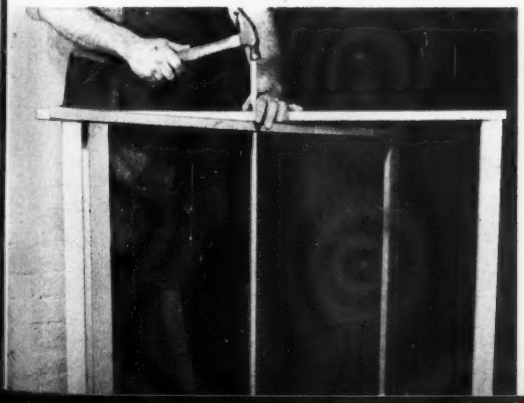
Cutting a notch at the back of the frame holds the top secure when it's upright.

Bathinette for Baby

Tubbing and dressing junior is less work with this useful combination.

IF THE stork has dropped a bundle at your home recently, you can cut down some of the bills by making the handy gadget on the left. To start the job, make the two folding frames from ¾ by 2 in. stock, following the drawing for sizes and details. The plywood covered top is made next and hinged to the rear frame using short dowels as shown in the photos. For the basin, use oilcloth backed by waterproof canvas, 36 by 49 inches and fold it with mitred corners, "hospital" style, so that it forms a shallow basin about 8 in. deep. To drain the tub, make a brass plug from a 3 in. length of ¾ in. pipe with a 1½ in. metal gasket soldered to the threaded end and the other tapered to take a 4 ft. piece of rubber hose. The plug is assembled with rubber gaskets and installed with a lock nut as shown in the photos. The basin is stitched to the frame and tacked to the corners. To finish the bathinette, cover the top with canvas-backed oilcloth, tack on some fancy edging and give the wooden frames two coats of enamel.

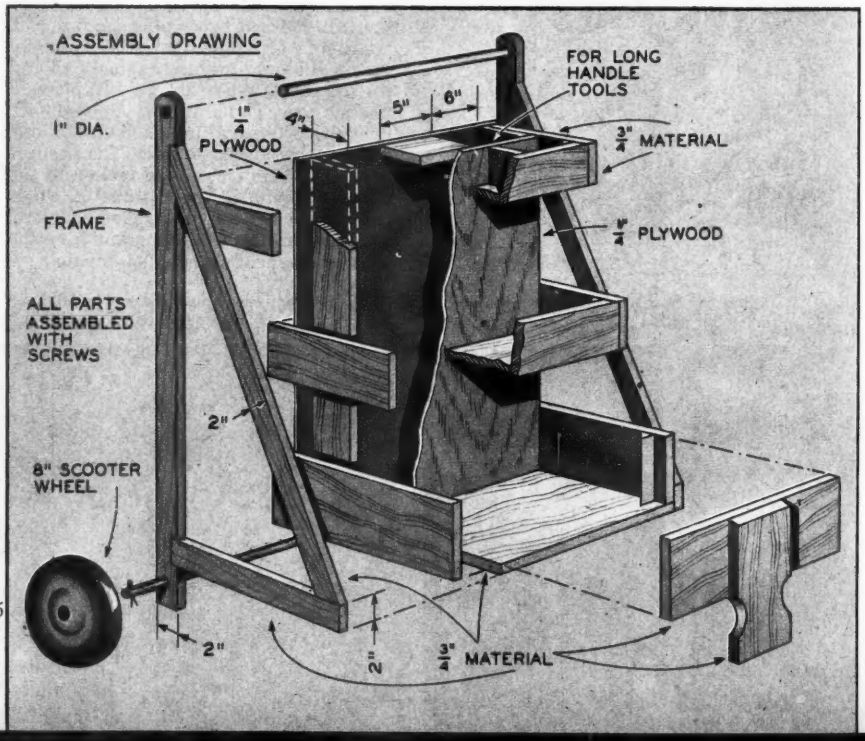
Driving a length of dowel through the frames to permit them to pivot and fold.



Parts of plug assembled before installing. Rubber gaskets are cut from inner tube.

step saver for the garden

THE man with the hoe in Markham's poem, may have been bowed with the weight of centuries but his modern counterpart, the backyard botanist is almost as badly laden. By the time he's collected a rake, shears, sprayer, seeds and a few other items, the average gardener looks like a walking clothes tree as he struggles out to till his soil. If he doesn't carry all this gear, it means wasted time making trips back to the garage or tool shed. As you've probably guessed already, the answer to the problem is to make this garden truck and carry all your paraphernalia on the first trip. Three boxes and a rear compartment are mounted between triangular frames and ride smoothly on rubber-tired scooter wheels with the load balanced over the axle. After all the parts are cut to shape, the truck is assembled with screws to take the beating it's bound to get in the garden.



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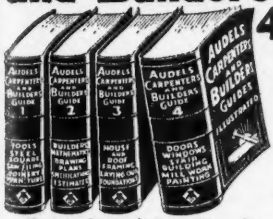

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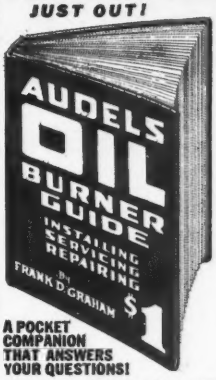

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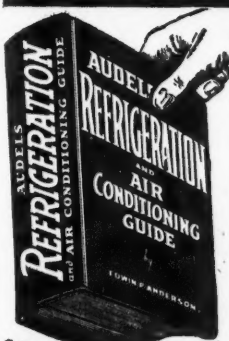

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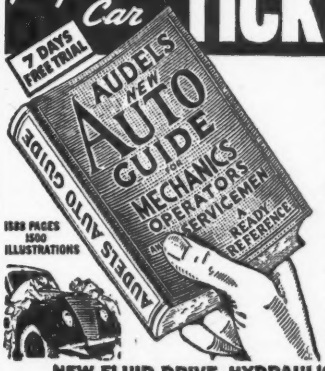

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Building Cruise-Mate

[*Continued from page* 127]

and lower house partners are rabbeted for the sides. Jig out the holes for the two oval side ports and cut the forward ends of the sides to follow the rake shown on Fig. 1. After the side assemblies are in place and bolted down to the deck partners, make the framing around the forward cabin window shown in the inset on Fig. 1. This is similar to that for the windshield shown in Fig. 7. The upper and lower cross members will have to be cut to fit between the cabin sides and also to conform to the crown of the deck and house top. The vertical pieces on either side of the window will also have to be custom cut to fit, as the dimensions given can only be approximated. Be sure this entire front cabin assembly is well glued and strongly doweled because it's a likely source for future leaks. All screw holes in the house sides and front should be plugged with either marine filler for the plywood or mahogany plugs for the bright work.

The house top carlins are sawn to shape next, each one being laid out separately. Use the scale on Fig. 1 to get a centerline for laying these out. The two rear carlins are cut away for the hatch framing over the companionway that's shown on Fig. 1. With this completed, the house is ready to be decked and covered with canvas. The canopy top and windshield assembly come next, again following Figs. 1, 3 and 7 for the details. The best way to complete this assembly is to build it separately and then raise it into place and bolt it on the cabin top. In making the windshield assembly scribe the bottom members to shape following the crown of the cabin top to get a tight fit. To complete the construction above decks, make and fit the cockpit coamings following the shape shown on Fig. 1. The forward ends of the coamings are fastened to the corners of the house by means of cleats screwed to the rear of the bulkheads. To finish the cockpit, cut the floor beams and fasten them in place, laying the ⅝ in. plywood flooring on top.

You're now ready for that part of the project where you can use your own ingenuity—namely the interior joinery work. After you've worked out the arrangement plan to your satisfaction, install the forward bulkhead and start operations by lining the space underneath the berths and rope locker with thin plywood so you don't have to hunt for things in the bilge. Run stringers along the frames at the side and along the floors to support the cross members that hold up the bunk boards. With these completed, cut sections of scrap plywood as floors to fit between the berths.

The last step in the actual construction is to make the outboard rudder installation, the details of which are shown in Fig. 8. This arrangement is necessary because with the Evinrude Speeditwin motor or any other make in the stern well, there isn't enough space to turn it for full rudder. The hardware figure numbers for the rudder sheaves and the other parts refer to the catalog of the Wilcox-Crittenden Company at Middletown, Conn. However, similar fittings of other manufacturers may be substituted.

The original color scheme on Cruise-Mate consisted of blue decks and canopy top, light gray topsides and hull down to the waterline. Maroon colored anti-fouling paint was used on the bottom with a black boot top. All exterior and interior mahogany was varnished and the inside of the cockpit and cabin painted a soft gray.

BILL OF MATERIALS

(Approximate quantities required)

Waterproof Marine Plywood

Bottom, Sides, Decks	16 Pcs.	⅜" x 4' x 8'
Cabin Floors, House and Canopy Tops	5 Pcs.	¼" x 4' x 8'
Cockpit Floors, Outer Transom, etc.	5 Pcs.	⅜" x 4' x 8'
Inner Transom, Stem, Bulkheads, etc.	2½ Pcs.	¾" x 4' x 8'
Stern Knee, Quarter Knees, etc.	Made from plywood scrap	

Seasoned White Oak

Frames (No piece need exceed 4'-9")	100 Lineal Ft.	¾" x 3'
Cheek Pieces at Transoms	46 Lineal Ft.	¾" x 2"
Keel	1 Pc.	1½" x 6" x 13'-6"
False Keel	1 Pc.	¾" x 1½" x 13'-6"
False Stem	1 Pc.	⅜" x 1" x 7'-6"
Chine Stringers	2 Pcs.	1" x 2" x 19'
Outer Chine Pieces	2 Pcs.	⅜" x ¾" x 19'
Oak Fillers At Chine and Keel	Made from frame scraps	
Sheer Stringers	2 Pcs.	1" x 2" x 20'
Sheer Molding	2 Pcs.	1½" Half Rd. x 20'

Spruce or Yellow Pine

Bottom and Side Stringers	2 Pcs.	1" x 3" x 20'
	2 Pcs.	1" x 3" x 18'
Clamps	2 Pcs.	1" x 2" x 20'
Deck Partners	2 Pcs.	1½" x 2¾" x 16'
Upper and lower house partners (or mahogany)	4 Pcs.	1½" x 3" x 8'-6"
Main Deck Beams (Sawn to crown)	45 Lineal Ft.	¾" x 3"
Deck House Carlins (Sawn to crown)	63 Lineal Ft.	¾" x 14"
Canopy Top Carlins (May be steam bent or built-up laminated stock to save waste in cutting crown)	63 Lineal Ft.	¾" x 7"
Canopy Partners	2 Pcs.	1¼" x 2½" x 14'-6"
Floor Beams (or fir)	119 Lineal Ft.	¾" x 2½"

Mahogany

Inside Trim	2 Pcs.	¼" x 8" x 8'-6"
Windshield and Side Windows	2 Pcs.	1¼" x 4½" x 4'
Window Frames	12 Lineal Ft.	¾" x 3"
Styles	12 Lineal Ft.	1¼" x 3"
Cockpit Coamings	2 Pcs.	⅝" x 19" x 8'
Front and Sides	1½" x 9" x 17'	
Toe Clip and Spray Rail (Tapered down to ¾" x 1½", each 20' long)	2 Pcs.	¾" x 3" at stem
House Moldings	92 Lineal Ft.	⅜" Half Rd.

Miscellaneous

Rope Locker, Interior Joiner Work, Hatch Covers, etc.	Made From Scrap
Deck Canvas	190 Sq. Ft. 12 ounce
Paint, Fastenings—Bolts, Screws, Tacks, Marine Glue and Filler, etc. Castings and Hardware as specified.	

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Speed Kings of the Deep

[*Continued from page* 104]

top swimmers, who propel themselves independent of tide or current, who are the real speed demons. In this group are the whales and squids, whose bodily formations are more or less torpedo-shaped—no accident but the result of an evolutionary response to certain mechanical requirements demanded by the density of environment.

Result No. 3 relates speed and dining habits. For example: the mackerel gobbles small crustaceans and small fish such as the herring. The tunny and bonito, which can zip along faster than the mackerel, dine on small crustaceans and herring—and they also gobble mackerel. The swordfish, sailfish and spearfish, which in turn are faster than the tunny and bonito, make meals of crustaceans, herring, mackerel and—you guessed it—on the tunny and bonito as well.

For the ultimate in piscatorial streamlining, take the sailfishes and the spearfishes. The head merges smoothly into the body and the body slides slickly into the tail, every line unbroken, every contour rounded. The jaws fit closely into each other with no ridges to impede progress at the critical point where the fish cuts the water. The eyes are flush with the surface, the gill covers fit closely into the sides of the head, and the overlapping scales which cover body and tail offer no resistance to forward movement.

Starting midway where the body is thickest, there are hollow curves on each side of the fish's body which extend backwards to the tail: this insures a free passage for the water displaced when it darts through the water. And the entire surface of the body is covered with a slime which by its lubricating effect reduces friction with the surrounding water.

The self-cooling combustion engine is a chief factor in the anatomical setup of fast fish. Tremendous bursts of speed can be achieved only by intense muscular activity, and such activity is always accompanied by the generation of heat.

Now, in all animals there is a maximum temperature beyond which the cells of life would start to disintegrate. To avoid this, muscular activity requires an adequate cooling process. In man, cooling takes place through the acts of perspiring and panting. Fish, being cold-blooded animals, automatically assume the temperature of the surrounding water. That's their self-cooling secret.

In this factor may be found the anatomical reason why the fastest cetaceans, whales, have an initial disadvantage in the attainment of high speeds, compared with the fastest fishes. Whales are mammals and therefore warm-blooded. They must contend with the problem of evolving a rapid cooling mechanism, a problem fish do not have.

MI Fleetster

[*Continued from page* 141]

covering will pull quite tight, then it can be given several coats of thinned dope to fill the pores and retain the tightness. The fuselage is best covered by using narrow strips of tissue along the stringers. Three to five strips for both top and bottom will do the job easily, depending on the dexterity of the builder. Cover the sheet balsa sections with paper so that colored dope will find an identical surface. Each side of the tail surfaces is covered with one sheet. Fasten the paper at the outside edges of the surface; when it is doped later it will adhere to all the wood surfaces it presses against. The wing is covered with panels of paper, one for each flat section between dihedral breaks. When using water to shrink the paper, wet one section at a time and pin that section flat to the bench. It will not adhere to table, so don't worry. When the dope is drying, check for warps, for now is the time to take them out by holding the surface in question in position while the dope dries. Colored dope can be used, if desired, but remember it does add weight. We trimmed the original airplane with two coats of red. Use masking tape to obtain sharp edges.

Since the Arden power pack is used, the builder is deprived of movable batteries as a means of balancing. For those using other than complete Arden power units, details are shown on the plans. In these types, it will be possible to shift the battery pack for balance. However, your model should be pretty much on the ball from the start. Let's glide it first. Crouch close to the ground and launch it smoothly but quickly with the nose at a slight downward angle. Aim at a spot about fifteen feet away. If the model dives in slightly, catching its wheels and perhaps turning over, add a 1/16 in. thick piece of sheet balsa under the trailing edge of the stabilizer. If necessary, add more slivers but don't end up with more than 3/16 in. space between the fuselage and the rear of the tail. After that add slivers under the leading edge of the wing. This, by the way, is an extreme case. The model should appear to glide a trifle nose heavy. The perfect looking glide will result in a power flight that will stall severely or may even loop. Now try a powered flight. Throttle the engine down, set the timer for about eight seconds or more, and launch the ship. Don't shove it this time; let the engine help fly it out of your hand. Later, when the engine is opened up, it should practically fly the model from your hand as you move it slowly forward. If the ship stalls a bit, remove some of the incidence. Once the glide after the power cut becomes smooth, strive to get the ship to turn, both in the glide and under power. If the ship turns slightly to the left under power, it will reverse that turn (due to the rudder [*Continued on page* 162]

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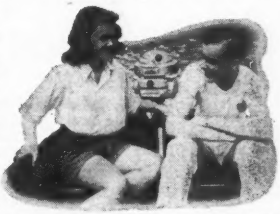

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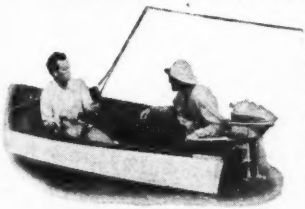

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It all adds up to finer *performance!* And back of every Evinrude is the priceless advantage of organized, responsible, nationwide *service* . . . available everywhere through a veteran organization of selected dealers. *See your Evinrude dealer* — look for his name in your classified phone directory under "Outboard Motors". *Catalog free!* Address, EVINRUDE MOTORS, 5458 N. 27th St., Milwaukee 9, Wisconsin

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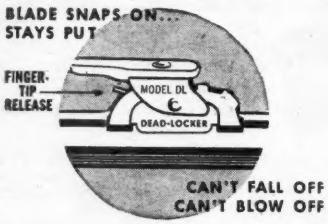
FIRST IN OUTBOARDS • 38TH YEAR

ANCO RAIN-MASTER

"Dead-Locker"

WINDSHIELD WIPER ARMS and BLADES



(A war-born invention—by ANCO—first for military aircraft—now for your car.)

DON'T SHOOT YOUR GAS-PUMP MAN!

He's doing the best he can. Sure, he knows how dangerous it is for you to drive your car . . . in stormy weather . . . with your dull old windshield wipers that smear and smear. He'd gladly put on for you quickly a pair of keen new ANCO RAIN-MASTER Wiper Blades and Arms. He has them—Newest Models! But he forgets to remind you? Too busy? You can't shoot him for that!

After all, it's *your* car to protect. So *you* remind *him*. Get RAIN-MASTERS . . . patented features . . . original equipment on many makes of high grade cars and trucks . . . used in war—on our fighting tanks and trucks and ships and bombers too...because ANCO RAIN-MASTERS clean quicker, clean cleaner . . . last longer. May save you a costly smashup.

Ask for RAIN-MASTER Windshield Wiper Arms and Blades next time you buy gas.

THE ANDERSON COMPANY
Established 1918
GARY, INDIANA

"Selenium Rectifiers"

[*Continued from page* 120]

which employed a 25Z5 or 35Z5 rectifier tube. Using this hookup with the 403D2625 type selenium rectifier, a current of up to 100 milliamperes is available. It higher current ratings are needed one of the heavier duty type should be employed. Similarly, if higher potentials are required, it is possible to use tripler and quadrupler circuits which will give voltages as high as 450 to 550 volts. In all these circuits it is well to realize that higher values of capacity than sual should be used not only to improve the filtering action but mostly to achieve better voltage regulation. Data sheets show an improvement of up to 14% in voltage regulation when the capacitors are changed from 20 mf. to 40 mf. A quadrupler circuit is shown in Fig. 2. These circuits eliminate the power transformer and rectifier tube or tubes and also save both space and weight. These latter circuits should find use among amateurs who like to have a small transmitter. Since this type of transmitter is usually a standby outfit and low powered, efficient use may be made of the 200 ma rectifier.

MI Fleetster

[*Continued from page* 160]

section) in the glide. If it banks dangerously to the left, add some right rudder. The object is to get a fairly tight turn in the glide.

If you don't like chasing, the control-line trainer version is for you. The mount for the control plate is secured by means of two nuts cemented to a plywood brace inside the fuselage. The control plate slips over the machine screw in the mount which serves as the pivot. The elevator is attached to the stabilizer which is formed from sheet aluminum and fastened in slits in the trailing edge of the stabilizer. Hardwood blocks are glued into the ends of the elevator to serve as bearings. Two short $\frac{1}{16}$ in. diameter music wire pins are inserted through the hinges and into the hardwood blocks. One is removable so the elevator can be removed for free flying. The music wire pushrod is inserted with one end in the control plate and the other in the control horn. The wire guide for the control lines is attached to the underside of the left wing panel and is made of two pieces of wire, as shown. Test fly your model on 35-50 foot lines.

CRUISE-MATE BLUEPRINTS

LARGE-SCALE working blueprints, containing complete building instructions and a bill of materials, for the 19 ft. all-plywood, outboard cruiser described on pages 122 to 127—No. B-144, Price $3.00 per set. Send your order to Fawcett Publications, Greenwich, Conn., enclosing check or money order. Canadian orders should include International Postal Orders, in U.S. funds.

Atlas LATHES Speed Up Auto Servicing

Garages and automotive shops all over the country are rapidly equipping with Atlas lathes. It's a profit hint to consider if you operate or work in such a shop — something to remember as a valuable use for an Atlas in your home shop.

Six typical Atlas lathe servicing jobs are shown above. All told there are 44 different ways to keep an Atlas busy in modern automotive repairing.

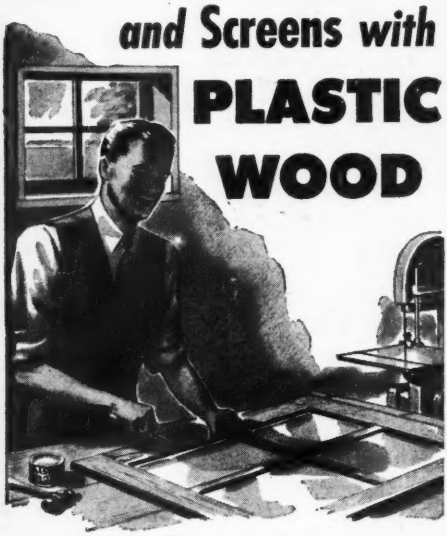
Atlas lathes are preferred for such work because they are: (1) compactly engineered for minimum space (2) easy to set-up and operate (3) work to close tolerances (4) extremely versatile (5) ruggedly built for years of precision service (6) available at low cost.

Ask your Atlas distributor for complete details and delivered prices.

SEND FOR FREE CATALOG

Get complete information about Atlas lathes, drill presses, millers, shapers, and the many inexpensive accessories available for Atlas tools. Send for this free catalog today. Atlas Press Co., 452 North Pitcher Street, Kalamazoo 13D, Michigan.

Repair Storm Windows and Screens with PLASTIC WOOD



When making new screens, or replacing old rusted screen, apply thin layer of PLASTIC WOOD around frame after tacking down screen. This gives greater strength to the frame. PLASTIC WOOD can be easily shaped to match broken molding. Valuable in replacing rotted wood in storm windows.

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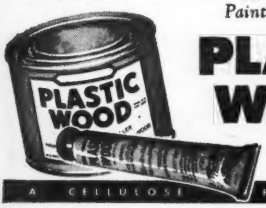

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Works Wood, Metal, Glass, Plastics

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CASCO PRODUCTS CORPORATION, BRIDGEPORT 2, CONN.

MI Previews New Cruisers

[*Continued from page* 79]

back, there's a sink, stove and dish rack.

Lowest-priced cruiser in the "big boat" class is the Matthews' 38 footer from Port Clinton, Ohio. Selling for about $14,500, the boat has cruising accommodations for six and a 16 mph speed. Her only fault is a lack of light and air below decks.

The Owens 42 ft. "Flagship" has beautiful clean lines and a thoroughly modern design. Selling in the $17,000 bracket, she has berths for seven and one of the largest deck houses in the fleet. Some of the interior arrangements, particularly in the galley could be improved.

The largest of all the stock cruisers launched this year is the 46 ft. flying bridge model of Chris-Craft at Algonac, Michigan. If you have the $25,000 on the price tag, you'll really be in the luxury class. The boat sleeps nine in four separate cabins and does a smooth 24 mph. While the hull design is excellent, her top hamper lacks the modern touch of other builders.

For design and performance, the Harco "40" at $25,000 is tops in any class. Built by the Harbor Boat Building Company at Terminal Island, California, she is 40 ft. overall and does 40 mph. Her deck house and forward cabin have luxury accommodations for six.

Motorcycling is TOPS for FUN and THRILLS!

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No wonder motorcycling is the favorite sport of so many fun-loving, vigorous, red-blooded young men and women! There's a thrill to riding a new 1947 Harley-Davidson that beats anything else on wheels. Owners have grand times — they belong to clubs—make new friends — compete in endurance runs, race meets and hillclimbs. They get out on the open road and tour the country — even tour other lands. Don't merely *wish* for good times — when you can roll up so many pleasure-filled miles on your own Harley-Davidson! Get set for the happiest evenings, weekends and vacations of your life — see your Harley-Davidson dealer NOW — and mail the coupon today.

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GET A GOOD START with the HANDEE KIT

Handee and 40 most practical accessories packed in a compact steel case. You'll be amazed at what you can accomplish. Complete, postpaid, $27.50. Handee, with 7 accessories, $20.50.

FOR YOURSELF OR A FRIEND... THE GIFT OF A LIFETIME!

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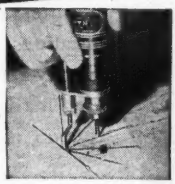

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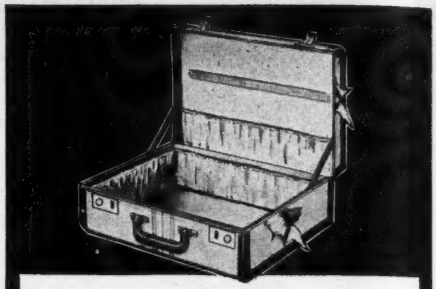

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Airliners Need Not Crash!

[*Continued from page* 53]

ease of the daring young man in the song. Are our pilots flying too technically and not enough by the "seat of their pants"?

It's all very well to fly by instrument, but unless our crews can carry on *without* instruments, what happens? Read the headlines.

Our crews fly most of the time on instruments and the automatic pilot, following radio beams. Our military pilots flew much of the time by dead reckoning, smart navigation and check points. When our ex-military pilots turn civilian transport pilots they must take courses in how our transport crews have been flying the cash customers. Why not give the military boys a chance to teach our civilian crews a few of their tricks? It might pay off.

More and better alternate fields are a must, whatever the cost:

Let's get those war-born safety gadgets working, give our pilots more training in what to do when the gadgets don't work, get those alternate fields built and used, put better and surer fire-fighting equipment on all planes, and make it news when a plane *does* crash.

As one personally involved in aviation and feeling a degree of social responsibility I speak earnestly and strongly. Let air travel's great future not be delayed!

A full day's hunting on one loading with Marlin's dependable tubular magazine .22

• Shooting efficiency, with the least fuss and bother, is what you get in the 81-DL. Tubular magazine holds a load for a full day's hunting of small game. And this man-sized Marlin is light enough to carry all day without tiring.

CHECK THESE SPECIFICATIONS —FOR VALUE AND FOR SPORT!

One-piece buttstock, with fluted comb and semi-beavertail forearm.

Quick-release trigger; self-cocking action; side ejection; On and Off safety.

24" tapered blued steel barrel; Ballard type rifling; crowned muzzle.

Unique, patented feeding mechanism; magazine capacity 25 - .22 short, 18 long rifle cartridges.

Shoots .22 short, long and long rifle—regular and high speed—without adjustment.

Removable, plated bolt assembly; flush takedown screw.

Equipped with peep sight, ramp front sight and hood; sling strap swivels. Also available with open rear sights, bead front sights, no swivels.

Outstanding for rugged construction, reliability and accuracy.

Unbeatable for pests and vermin...owls, rats, hawks and crows, the 81-DL carries up to 25 shots.

Marlin's 81-DL is a sure getter of woodchuck, raccoons, rabbits and other fur-bearing small game.

Finely balanced for plinking and general target work, the 81-DL is also an ideal "learning gun."

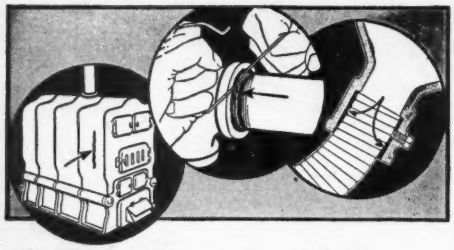
Marlin 81-DL

25-Shot Tubular Magazine .22 Cal. Repeating Rifle

$25.55. *Price Slightly Higher West of the Rockies.*

SEE THE MARLIN 81-DL AT YOUR DEALER'S TODAY

THE MARLIN FIREARMS CO., NEW HAVEN, CONN. • *Fine Guns Since 1870*



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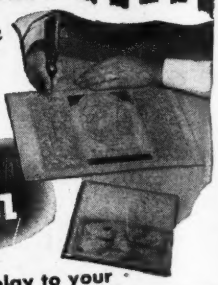

You can give full play to your ideas...get finer results, much faster, on any kind of leather tooling project. In addition, your Vibro-Tool can engrave jewelry, emboss metal, do a limitless number of other craft jobs with hand-work precision yet in record time. (110 V. AC, 60 Cycles) Tool with engraving needle $7.50

Vibro-Tool, 22 accessories and sharpening stone, in handsome hinged hardwood box, complete for only.... $16.50

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Fresh-Water Still

[*Continued from page* 75]

the conventional still. One of the more important features of the still is that it can be put into operation by just one man, whose only job thereafter is to see that the still gets a sufficient supply of water.—*Don Romero.*

You Cannot Tell a Lie

[*Continued from page* 81]

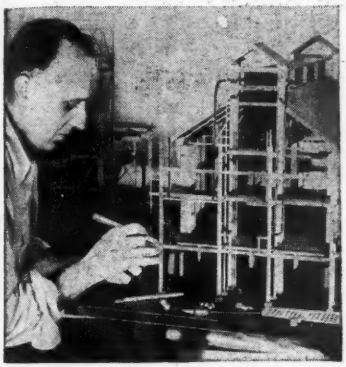
the part of the subject. The subject sits facing away from the operator so that facial expression will not be an influencing factor. He is seated in a large, comfortable chair and the questioning is conducted in a low monotone.

The questions are prepared in advance, after a summary of the case and the subject's personal history have been studied as a guide. They are phrased to require a yes or no answer, and they are specific to the individual and to the case at hand. Several sets of questions are drafted and two or three sets are posed on each of two days to gain corroborative evidence, as the emotional conditions may differ on different days.

The suspect or witness, confronted with visible proof that he has been lying, usually breaks down and tells the truth.

New X-acto Tools

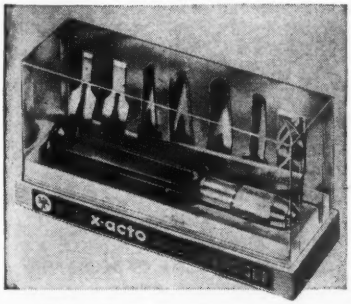
Scientifically designed to fit those small, exacting jobs



Makes Super-Furnace With Super-Knife

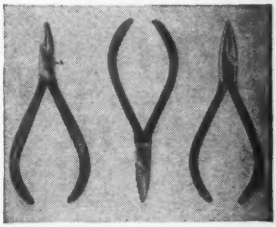
Wherever there's oil in the world, you'll find refineries designed by The M. W. Kellogg Company of New York. Here, Edmund Serafin, of the Kellogg Model Department, works on a model of a cracking furnace embodying new developments in engineering and design.

Naturally, Mr. Serafin is using the knife that embodies the newest developments in model-building tools . . . X-acto! He likes its scalpel-sharpness, its wide variety of blades. But *especially* he likes the way this long-handled knife reaches 'way inside the model to otherwise inaccessible parts.



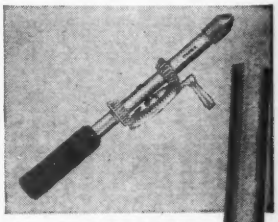
New No. 77 X-acto Woodcarving Set. Perfect tool for wood, plastics, linoleum, etc. Includes 6 different chisel and gouge blades, 4 assorted regular blades, 2 3-inch blades, 1 handle designed to take all blades. Complete with hardwood block, transparent cover, $3. Other Knives, Tools, Chests, 25c to $49.50. (*Prices slightly higher in Canada.*)

No. 50 X-ACTO HAMMER SET — 6 heads: 2 ball; 3 flat (steel, brass, plastic); 1 tinner's hammer with angle-locking set screw. Set, $1.50.

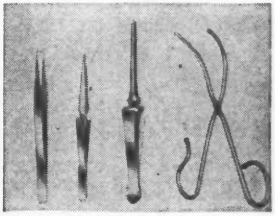


PLIERS — Case hardened. For wire-forming, etc. No. 58, combination round and flat, $1.85. No. 56, flat nose, $1.75. No. 57, point nose, $1.75.

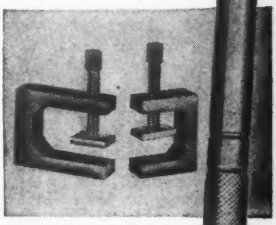
"BEGINNERS' LUCK" — No. 81 X-acto Modelbuilder's Basic Kit: No. 2 Knife; 5 regular, 2 3" blades; planer; sander. Complete, $2.50.



No. 47 HAND DRILL — Double pinion action, spring steel chuck. Takes drills up to 3/16". $2.75.



TWEEZERS — Steel, with plated finish. No. 36, plain, 35c. No. 38, cross-action self-locking, pointed, 50c. No. 37, cross-action self-locking, blunt, 45c. No. 39, cross-action, 60c.



C-CLAMPS — Magnesium, high rigidity, steel screw, aluminum locking plate. No. 51, 30c. Nos. 52 & 53, 40c. No. 54, 50c.

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SAVES YOU VALUABLE TIME AND MONEY!

This portable DYNAMIC WELDER—easily carried to the job—can be operated from any convenient, properly wired 110 volt, 60 cycle line. Can also be supplied for 220 volt, 60 cycle operation and for other voltages and cycles at slight additional cost. Works on IRON, STEEL, BRASS, BRONZE, AND OTHER METALS—has 8 metallic and carbon arc welding heat stages—does work you would think only possible with larger more expensive machine.

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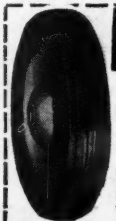

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Fabricating plastics offers you a fascinating hobby or a profitable business. New Carmen-Bronson Plastics Handbook tells you how; gives construction plans. New Carmen-Bronson Catalog lists all needed materials—Plexiglas, Lucite, Bakelite, Lignolite, Tenite II, Lumarith in sheets, rods, tubes, special shapes—clear and glowing colors. Also plastics dyes, cements, accessories and supplies. 10c brings you both catalog and handbook. Send for them today.

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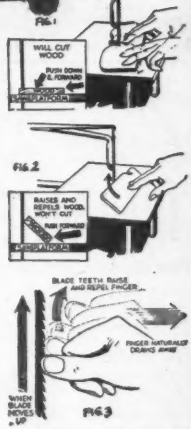

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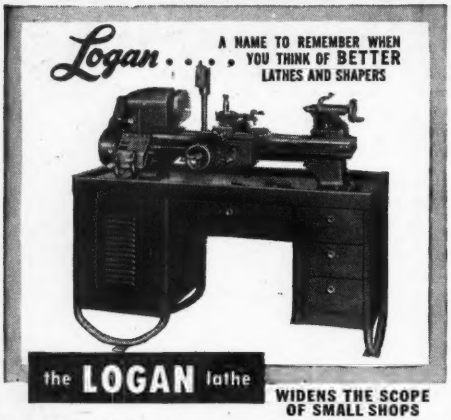

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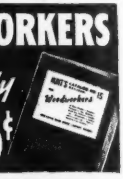

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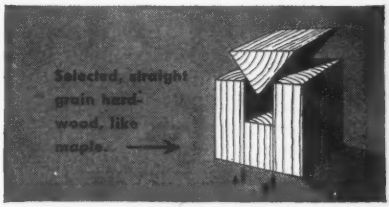

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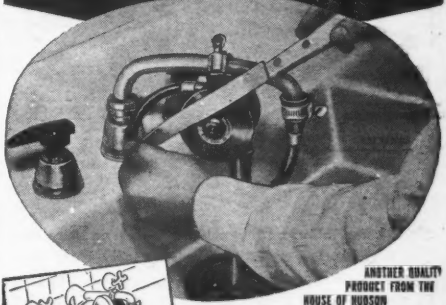

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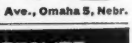

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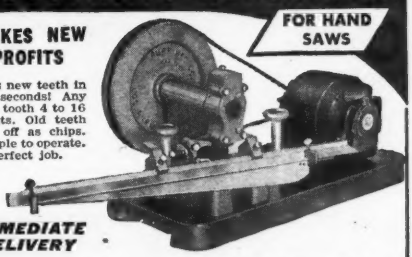

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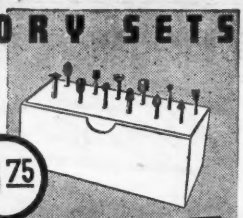

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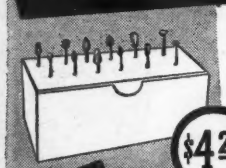

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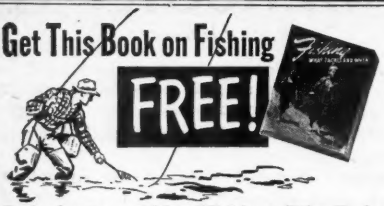

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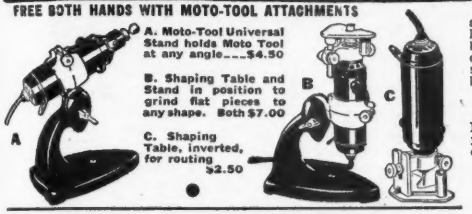

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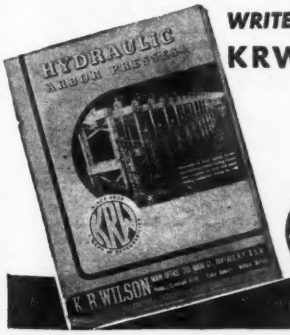

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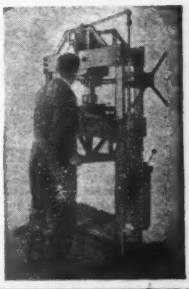

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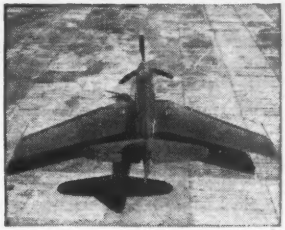

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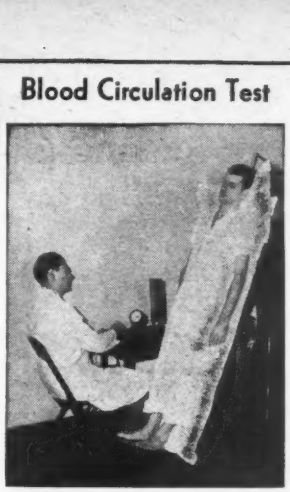

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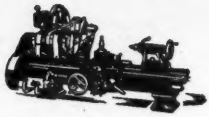

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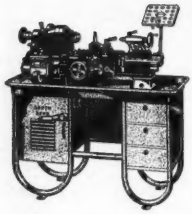

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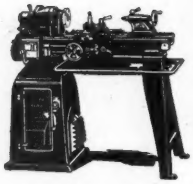

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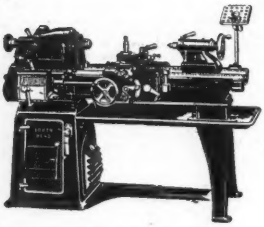

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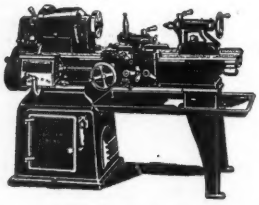

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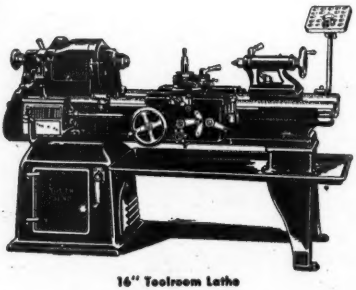

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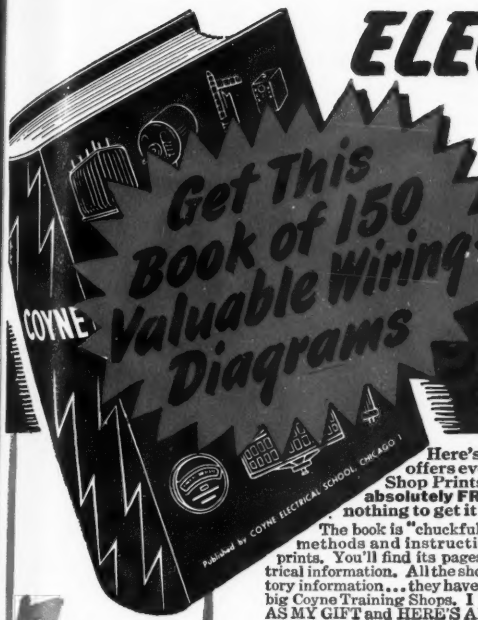

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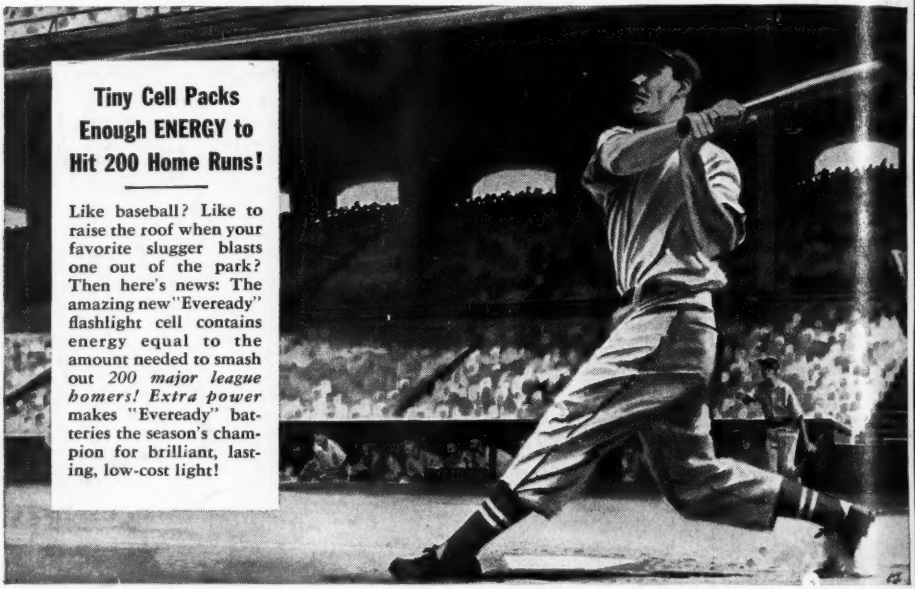

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